



US011357340B2

(12) **United States Patent**  
**Waters et al.**

(10) **Patent No.:** **US 11,357,340 B2**  
(45) **Date of Patent:** **Jun. 14, 2022**

(54) **DURABLE CRIB SHIELD SYSTEM**

USPC ..... 5/424, 425, 427, 93.1, 99.1, 100, 663,  
5/946

(71) Applicant: **BreathableBaby, LLC**, Minnetonka,  
MN (US)

See application file for complete search history.

(72) Inventors: **Dale Richard Waters**, Eagan, MN  
(US); **Susan Marie Waters**, Eagan,  
MN (US)

(56) **References Cited**

U.S. PATENT DOCUMENTS

(73) Assignee: **BreathableBaby, LLC**, St. Louis Park,  
MN (US)

1,056,712 A	3/1913	Schweda
2,128,978 A	9/1938	Akin
2,566,790 A	9/1951	Blookfield
2,727,242 A	2/1954	Pascal
2,784,420 A	3/1957	Moltane
2,808,596 A	10/1957	Schreiner
2,927,331 A	3/1960	Ruiz
3,103,669 A	9/1963	Mundis
3,183,527 A	5/1965	Turner

(Continued)

(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/547,264**

FOREIGN PATENT DOCUMENTS

(22) Filed: **Aug. 21, 2019**

DE	102006024855 A1	12/2007
FR	2867045 A1	9/2005
WO	9956588 A2	11/1999

(65) **Prior Publication Data**

US 2019/0374046 A1 Dec. 12, 2019

OTHER PUBLICATIONS

**Related U.S. Application Data**

“Safe-N-Secure Crib Liner” datasheet [online]. Tender Creations,  
Inc., Southampton, MN [retrieved on Feb. 4, 2000]. Retrieved from  
the Internet: URL:<http://www.tendercreations.com/cnbliner.htm>; 8  
pgs.

(63) Continuation of application No. 15/195,621, filed on  
Jun. 28, 2016, now abandoned.

(Continued)

(51) **Int. Cl.**

<b>A47D 15/00</b>	(2006.01)
<b>A47D 7/00</b>	(2006.01)
<b>A47D 13/06</b>	(2006.01)
<b>A47D 9/00</b>	(2006.01)

*Primary Examiner* — Robert G Santos

(74) *Attorney, Agent, or Firm* — Winthrop & Weinstine,  
P. A.; Alicia Griffin Mills; Nadeem W. Schwen

(52) **U.S. Cl.**

CPC ..... **A47D 15/008** (2013.01); **A47D 7/00**  
(2013.01); **A47D 13/063** (2013.01); **A47D 9/00**  
(2013.01)

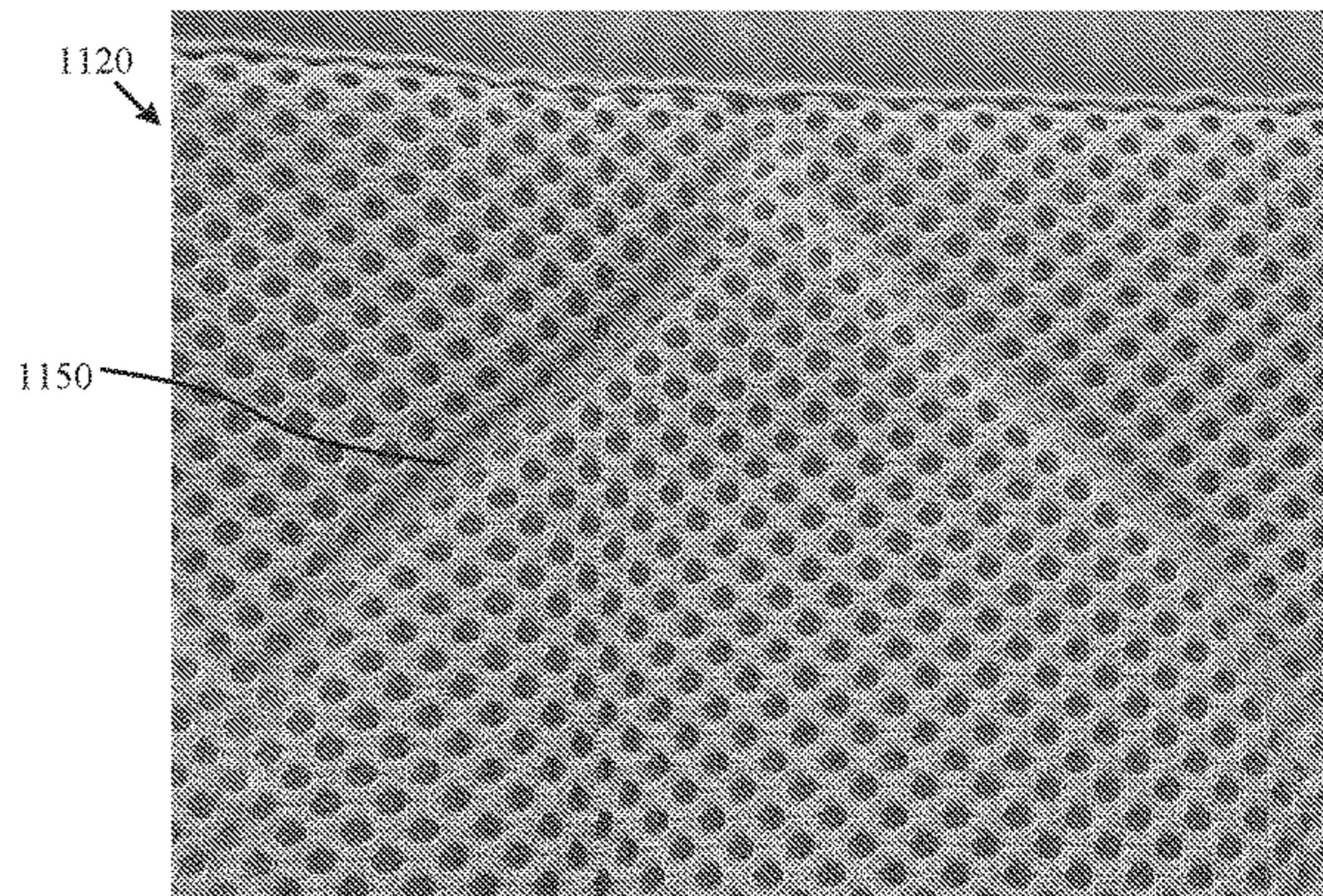
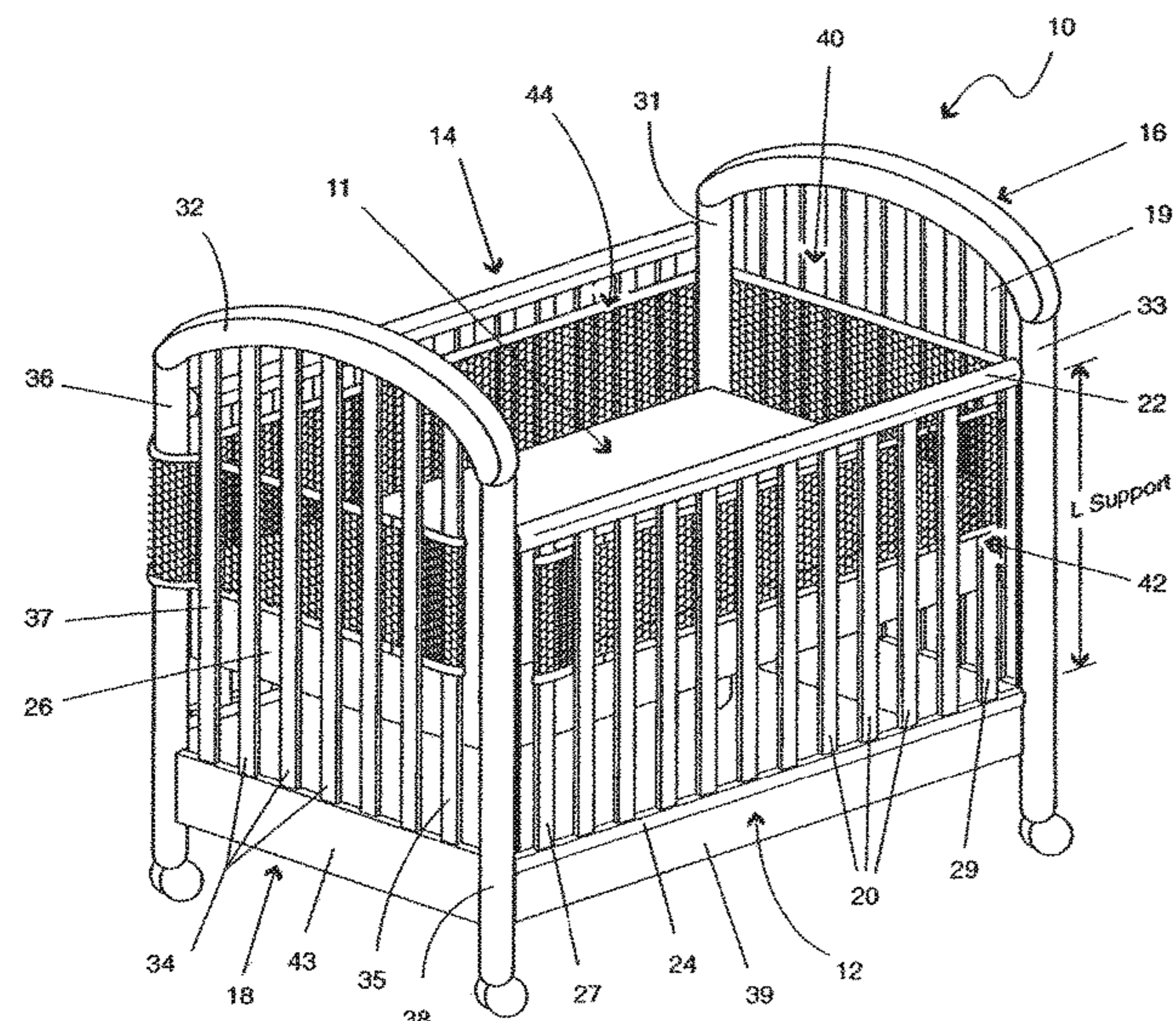
(57) **ABSTRACT**

A crib liner constructed of breathable material having a  
reduced suffocation resistance level for infant and toddler  
use. In some configurations, the breathable material may  
include an inner fabric, outer fabric, and a pile substructure  
between the front and back substructures, thereby allowing  
air to move effectively therethrough.

(58) **Field of Classification Search**

CPC .... **A47D 13/063**; **A47D 13/061**; **A47D 13/06**;  
**A47D 9/00**; **A47D 9/005**; **A47D 15/00**;  
**A47D 15/008**; **A47D 7/00**; **A47D 7/002**

**19 Claims, 27 Drawing Sheets**



(56)

References Cited

U.S. PATENT DOCUMENTS

3,199,123	A	8/1965	Komiske		6,012,756	A *	1/2000	Clark-Dickson .....	B62B 9/142 296/107.02
3,241,158	A *	3/1966	Berl .....	A47C 21/026 5/93.1	6,017,601	A	1/2000	Amsel	
3,325,832	A	6/1967	Malicki		6,019,421	A	2/2000	Roh	
3,438,069	A	4/1969	Long		6,039,393	A	3/2000	Roh	
3,619,824	A	11/1971	Doyle		6,055,690	A	5/2000	Koenig	
3,877,090	A	4/1975	Schutz		6,079,980	A	6/2000	Durand	
3,882,871	A	5/1975	Taniguchi		6,089,947	A	7/2000	Green	
4,232,415	A	11/1980	Webber		6,119,288	A *	9/2000	Hendrickson .....	A47D 13/063 5/97
4,280,342	A	7/1981	Eng et al.		D433,851	S	11/2000	Roh	
4,370,765	A	2/1983	Webber		6,151,733	A	11/2000	Takashima	
4,518,649	A *	5/1985	Wang .....	D06M 15/277 427/393.4	6,168,495	B1	1/2001	Yoon	
4,526,830	A	7/1985	Ferziger et al.		6,170,101	B1 *	1/2001	McCloud .....	A47D 15/008 5/424
4,579,753	A	4/1986	Gjendemsjo		6,174,584	B1	1/2001	Keller et al.	
4,644,591	A	2/1987	Goldberg		6,178,573	B1 *	1/2001	Wagner .....	A47D 15/008 5/424
4,651,367	A *	3/1987	Osher .....	A47D 7/002 5/99.1	6,243,895	B1	6/2001	Amin	
4,670,923	A	6/1987	Gabriel et al.		D444,329	S	7/2001	Newman	
4,716,594	A *	1/1988	Shannon .....	A41D 13/001 2/4	6,256,813	B1	7/2001	Aaron	
4,724,558	A	2/1988	Reiff		6,263,529	B1	7/2001	Chadwick et al.	
4,750,225	A	6/1988	Simons et al.		6,302,487	B1 *	10/2001	Fujita .....	B60N 2/5825 297/452.56
4,767,419	A	8/1988	Fattore		6,315,364	B1 *	11/2001	Fujita .....	A47C 7/24 297/452.56
4,864,669	A	9/1989	Jones		6,347,422	B2	2/2002	Heavrin	
4,885,200	A *	12/1989	Perdelwitz, Jr. ....	B60N 2/2812 428/136	6,421,857	B2	7/2002	Whatman et al.	
4,886,697	A *	12/1989	Perdelwitz, Jr. ....	A47C 27/005 428/192	6,434,768	B2 *	8/2002	Brown .....	A47D 13/063 5/99.1
4,890,346	A	1/1990	Rist		6,438,772	B1 *	8/2002	Brown .....	A47D 13/063 5/93.1
4,892,769	A *	1/1990	Perdelwitz, Jr. ....	A47C 31/001 428/68	6,438,775	B1	8/2002	Koenig	
4,900,377	A *	2/1990	Redford .....	B32B 27/12 156/62.2	6,489,000	B1 *	12/2002	Ogura .....	A47C 23/26 428/45
4,914,772	A	4/1990	Difloe		6,550,083	B1	4/2003	LaMantia	
4,922,565	A	8/1990	Blake		6,564,403	B1	5/2003	Titus	
5,010,611	A	4/1991	Mallett		6,618,880	B1	9/2003	Chase	
5,027,457	A	7/1991	Sweet		6,670,018	B2 *	12/2003	Fujita .....	D04B 21/02 428/156
5,086,530	A	2/1992	Blake		6,681,421	B2	1/2004	Carroll	
5,093,947	A	3/1992	Henegar et al.		6,684,437	B2	2/2004	Koenig	
5,111,544	A	5/1992	Graebe		6,718,577	B2	4/2004	Li	
5,241,718	A	9/1993	Pope		6,718,578	B2	4/2004	Li	
5,291,623	A *	3/1994	Artz .....	A47D 7/002 5/93.1	6,754,919	B2	6/2004	Leaphart, Jr. et al.	
5,385,036	A	1/1995	Spillane et al.		6,772,457	B1	8/2004	Alaback	
5,410,765	A	5/1995	Youngblood		6,859,958	B2	3/2005	LaMantia	
5,421,046	A	6/1995	Vande Streek		6,859,962	B2	3/2005	Diak/Ghanem	
5,509,157	A	4/1996	Story		6,910,896	B1 *	6/2005	Owens .....	G09B 23/288 434/267
5,515,559	A	5/1996	Benson		6,934,985	B2	8/2005	Sanders	
5,517,707	A	5/1996	LaMantia		D510,217	S	10/2005	Neveau	
5,566,407	A	10/1996	Lien		6,957,464	B1	10/2005	Coauette	
5,575,025	A	11/1996	Peters		6,971,130	B2	12/2005	Chase	
5,577,276	A	11/1996	Nicholson et al.		7,003,823	B1	2/2006	Reed et al.	
5,600,850	A *	2/1997	Shannon .....	A41D 13/001 2/4	7,007,325	B1	3/2006	Gomeh	
5,642,545	A	7/1997	Howard		7,055,192	B2	6/2006	Waters et al.	
5,699,571	A	12/1997	Yowell		7,056,023	B2 *	6/2006	Heidel .....	D06F 95/006 383/102
5,706,534	A	1/1998	Sherman		7,107,638	B2	9/2006	Wilson	
5,731,062	A *	3/1998	Kim .....	B29C 51/004 428/175	7,181,797	B2	2/2007	Chase	
5,787,534	A	8/1998	Hargest et al.		7,337,479	B2 *	3/2008	Van Huystee .....	A47D 15/00 446/227
5,788,332	A	8/1998	Hettinga		7,401,366	B1 *	7/2008	Costa .....	A47D 13/06 220/495.11
5,806,112	A	9/1998	Harms		D584,555	S	1/2009	Estee	
5,855,031	A	1/1999	Swift, Jr.		7,523,513	B2	4/2009	Waters et al.	
5,857,232	A	1/1999	Mahdavi		7,694,364	B1	4/2010	Toma	
5,870,785	A	2/1999	Hoorens		7,743,442	B2	6/2010	Maloney et al.	
5,881,408	A *	3/1999	Bashista .....	A47D 15/008 5/663	7,793,368	B2	9/2010	Burrell, IV	
5,897,164	A	4/1999	Kagan et al.		7,887,387	B2	2/2011	Colvin	
5,933,885	A	8/1999	Glassford		7,966,668	B2	6/2011	Bay	
5,937,458	A	8/1999	DeRosa		8,069,496	B2	12/2011	Sesselmann	
5,950,264	A	9/1999	Wyner et al.		8,161,584	B1	4/2012	Del Rio	
6,012,189	A	1/2000	Dudley		8,220,088	B2	7/2012	Waters et al.	
					8,321,980	B2	12/2012	Maloney	
					8,336,136	B1	12/2012	Lantos	
					8,365,323	B2	2/2013	Crumrine	

(56)

References Cited

U.S. PATENT DOCUMENTS

8,434,179 B2 \* 5/2013 Reeves ..... A47D 15/008  
5/663  
8,539,626 B2 \* 9/2013 Dunne ..... A47D 15/00  
5/424  
8,590,081 B1 \* 11/2013 Dunne ..... A47D 15/00  
5/424  
8,646,128 B2 \* 2/2014 Kaplan ..... A47D 15/008  
5/424  
8,661,581 B2 \* 3/2014 Kaplan ..... A47D 15/008  
5/424  
8,689,379 B2 4/2014 Cicci  
8,713,734 B2 5/2014 Davis  
8,793,813 B2 8/2014 Waters et al.  
8,887,332 B2 11/2014 Alletto  
8,959,683 B2 2/2015 Rochlin  
9,015,883 B2 4/2015 Alletto  
9,038,222 B2 5/2015 Cicci  
9,167,922 B1 10/2015 Holbrook et al.  
9,167,923 B1 10/2015 Holbrook  
9,204,731 B2 12/2015 Corodemus  
9,247,826 B1 2/2016 Holbrook et al.  
9,265,369 B1 2/2016 Beliveau  
9,392,880 B2 \* 7/2016 Do ..... A47D 7/002  
9,615,615 B2 4/2017 Slank  
9,700,150 B2 7/2017 Waters et al.  
9,730,527 B2 8/2017 Waters et al.  
9,993,095 B2 6/2018 Waters et al.  
10,016,064 B2 7/2018 Corodemus et al.  
10,492,624 B2 \* 12/2019 Marton ..... A47D 15/00  
10,694,868 B2 \* 6/2020 Waters ..... A47D 15/00  
10,722,049 B2 \* 7/2020 Waters ..... A47D 13/06  
2001/0000362 A1 \* 4/2001 Wagner ..... A47D 15/008  
5/424  
2002/0016991 A1 \* 2/2002 Brown ..... A47D 13/063  
5/99.1  
2002/0034901 A1 \* 3/2002 Fujita ..... D04B 21/02  
442/32  
2003/0033656 A1 2/2003 Jaeger  
2003/0080248 A1 5/2003 Morgan  
2003/0224691 A1 12/2003 Carey  
2004/0083697 A1 5/2004 Niakin  
2004/0128764 A1 7/2004 McGrath et al.  
2004/0154099 A1 8/2004 Waters et al.  
2004/0158910 A1 8/2004 Bay  
2004/0199999 A1 10/2004 Landry  
2005/0132498 A1 6/2005 Vrionis  
2005/0177942 A1 8/2005 Finn  
2005/0196075 A1 \* 9/2005 Heidel ..... D06F 95/006  
383/38  
2005/0198733 A1 \* 9/2005 Van Huystee ..... A47D 15/00  
5/93.1  
2005/0217030 A1 10/2005 Seigler  
2006/0010608 A1 1/2006 DeFranks et al.  
2007/0289060 A1 12/2007 Berkey  
2009/0313755 A1 12/2009 Burrell, VI  
2010/0154119 A1 6/2010 Shuttleworth  
2011/0041247 A1 2/2011 Moon  
2011/0113552 A1 5/2011 Miller  
2011/0220102 A1 9/2011 Waters et al.  
2012/0180215 A1 7/2012 Waters et al.  
2012/0241483 A1 9/2012 Waters et al.  
2012/0278995 A1 \* 11/2012 Kaplan ..... A47D 15/008  
5/663  
2012/0311792 A1 \* 12/2012 Reeves ..... A47D 15/008  
5/724  
2012/0317721 A1 \* 12/2012 Dunne ..... A47D 15/008  
5/424  
2013/0074260 A1 3/2013 Diamant  
2013/0097784 A1 \* 4/2013 Kaplan ..... A47D 15/00  
5/663

2013/0283533 A1 10/2013 Bendickson  
2013/0333112 A1 \* 12/2013 Dunne ..... A47D 15/008  
5/424  
2014/0096320 A1 \* 4/2014 Wilson ..... A47D 15/008  
5/424  
2014/0196211 A1 \* 7/2014 Kaplan ..... A47D 15/00  
5/424  
2014/0208504 A1 \* 7/2014 Do ..... A47D 15/00  
5/99.1  
2014/0223664 A1 8/2014 Kanbar  
2015/0164228 A1 6/2015 Scorgie  
2015/0342370 A1 12/2015 Ashworth  
2015/0351563 A1 12/2015 Alletto  
2015/0359353 A1 12/2015 Vainberg  
2016/0015193 A1 1/2016 Alletto  
2016/0066705 A1 \* 3/2016 Yaacoby ..... A47D 13/063  
5/99.1  
2016/0166092 A1 6/2016 Alletto  
2016/0331159 A1 11/2016 Alletto  
2017/0020312 A1 1/2017 Davis  
2017/0035215 A1 2/2017 Scorgie  
2017/0055737 A1 3/2017 Rochlin  
2017/0065093 A1 3/2017 Scorgie  
2017/0238723 A1 8/2017 Waters et al.  
2017/0099967 A1 10/2017 Holbrook  
2017/0367496 A1 \* 12/2017 Waters ..... A47D 7/00  
2017/0367497 A1 \* 12/2017 Waters ..... A47D 15/008  
2017/0367498 A1 \* 12/2017 Waters ..... A47D 15/008  
2017/0367499 A1 \* 12/2017 Waters ..... A47D 15/008  
2018/0027999 A1 \* 2/2018 Marton ..... A47D 15/008  
2019/0082859 A1 \* 3/2019 Marton ..... A47D 15/008  
2019/0261791 A1 \* 8/2019 Marton ..... A47G 9/0223  
2019/0374046 A1 \* 12/2019 Waters ..... A47D 7/00  
2020/0037793 A1 \* 2/2020 Waters ..... A47D 15/001  
2020/0100603 A1 \* 4/2020 Marton ..... A47D 15/00  
2020/0345156 A1 \* 11/2020 Marton ..... A47D 15/00

OTHER PUBLICATIONS

“Baby Carrier Air” datasheet [online], Babybjorn AB, Danderyd, Sweden. [retrieved on Nov. 3, 2006]. Retrieved from the Internet UBL:<http://www.babybjorn.com/TemplatesWeb/ProductDetails.asp?Itemid+2284>; 1 page.  
“Cozy Crib Tent” magazine advertisement. Tots in Mind, Inc., Salem, NH; 1 page.  
“High-Tech Toy Testing Equipment” datasheet [online]. U.S. Consumer Product Safety Commission [retrieved on Feb. 15, 2007]. Retrieved from the Internet: URL:<http://www.cpsc.gov/cpsc.gov/cpscput/prerel/prhtm101/0155.html>; 2 pgs.  
“Virtual Child Model” datasheet [online]. Nemours, Jacksonville, FL, [retrieved on Feb. 15, 2007]. Retrieved from the Internet: URL:[http://nemours.org/internet?url=no/news/releases/2000/001212\\_unsafe\\_toys.html](http://nemours.org/internet?url=no/news/releases/2000/001212_unsafe_toys.html); 2 pgs.  
Safe-N-Secure Crib Liner, 1998 Show Directory, The 29<sup>th</sup> Annual International Juvenile Products Show, Oct. 25-28, 1998 (Dallas, Texas).  
Cribble™ Crib Slat Safety Wraps, the 1999 International Juvenile Products Show Directory Oct. 23-26, 1999 (Dallas, Texas).  
Defendant’s Prior Art Chart from Prior Art Statement in *BreathableBaby, LLC v. Crown Crafts, Inc. and Crown Drafts Infant Products, Inc.*, Civil Case No. 12-cv-00094 (PJS/TNL) before the United States District Court, District of Minnesota.  
Plaintiff’s Response to Prior Art Statement in *BreathableBaby, LLC v. Crown Crafts, Inc. and Crown Crafts Infant Products, Inc.*, Civil Case No. 12-cv-00094 (PJS/TNL) before the United States District Court, District of Minnesota.  
Gershman, Maurice, M.D. “Self-Adhering Nylon Tapes,” *Journal of A.M.A.* (vol. 168, No. 7) Oct. 18, 1958.

\* cited by examiner

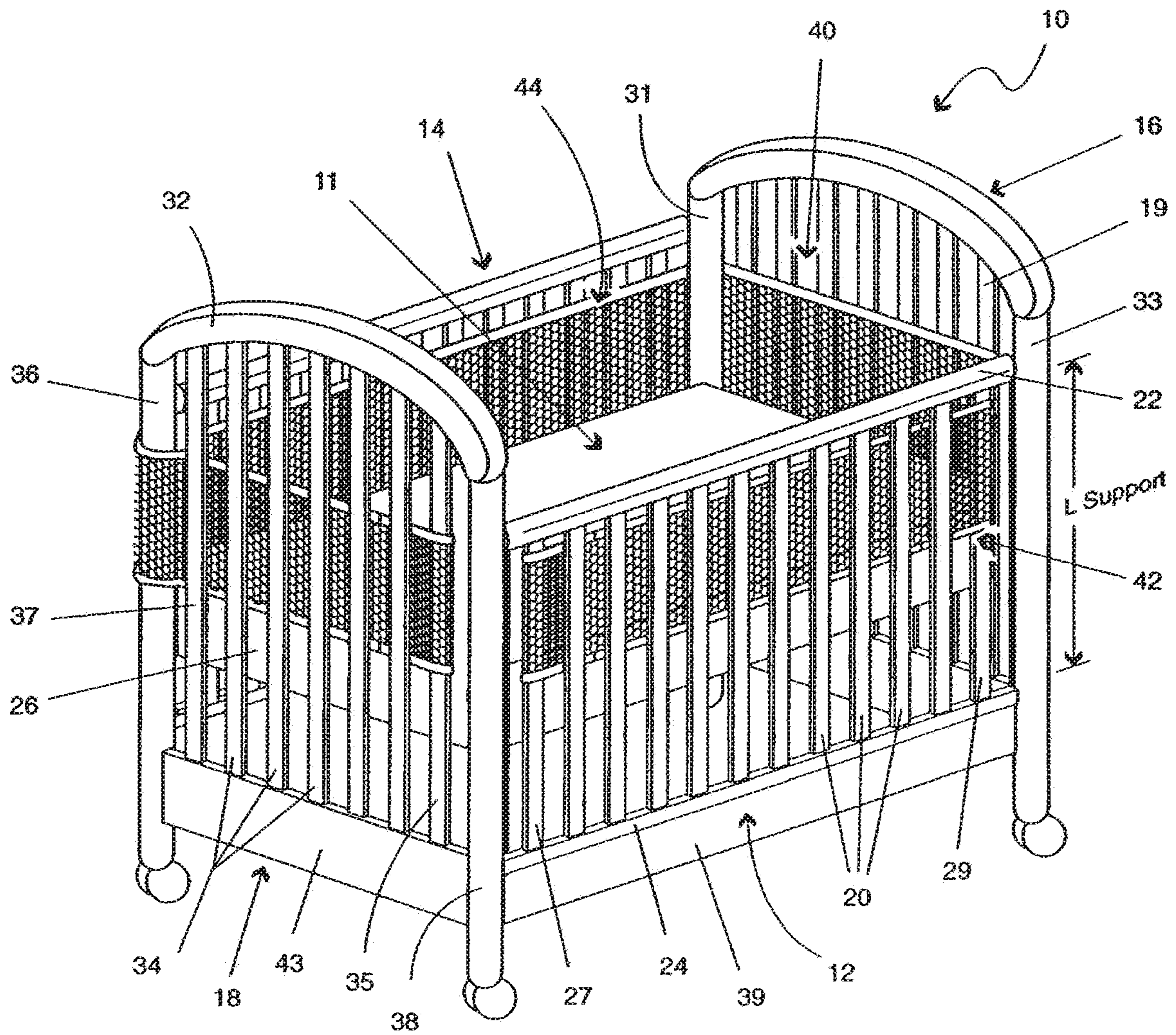


FIG. 1A

FIG. 1B

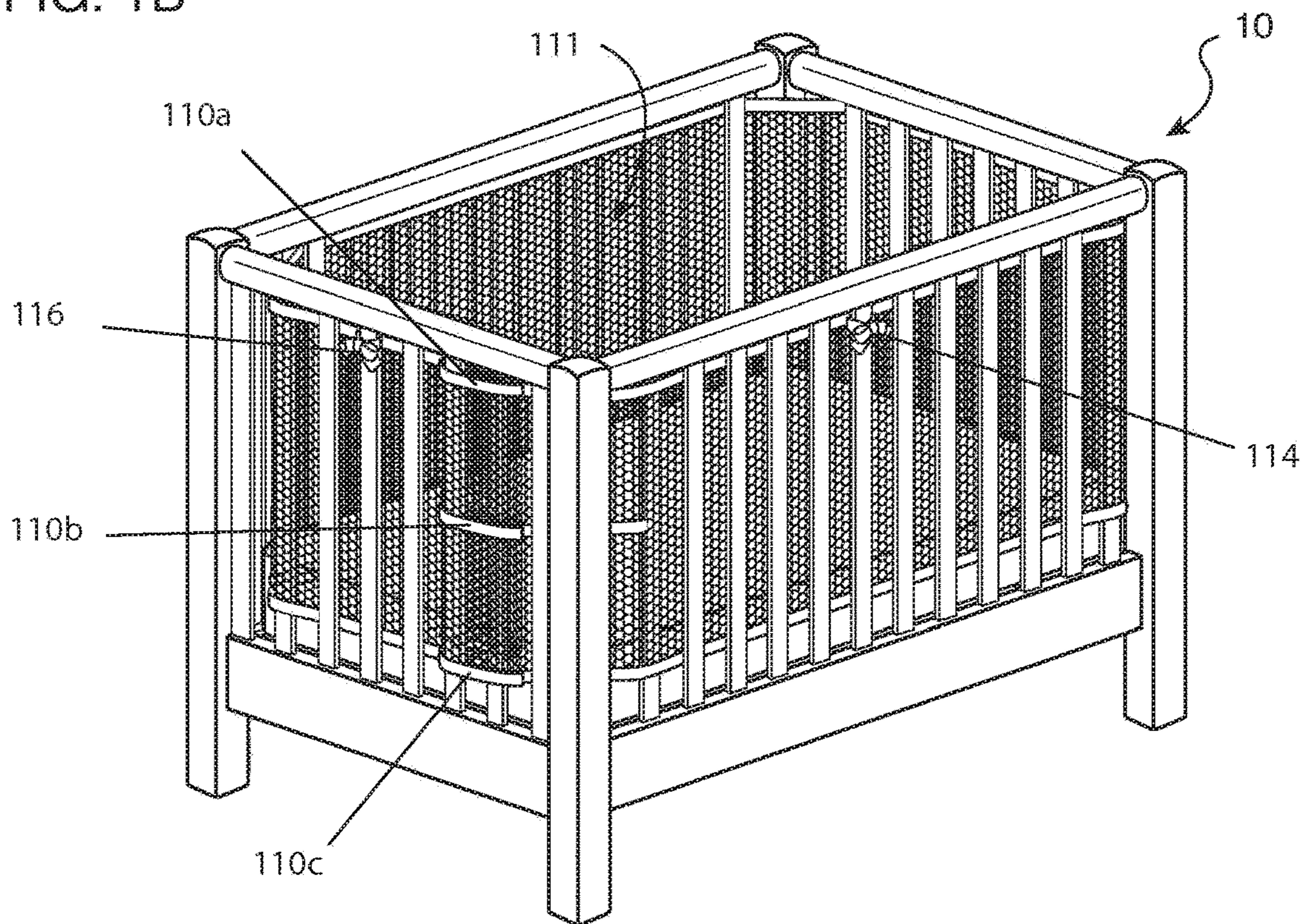


FIG. 1C

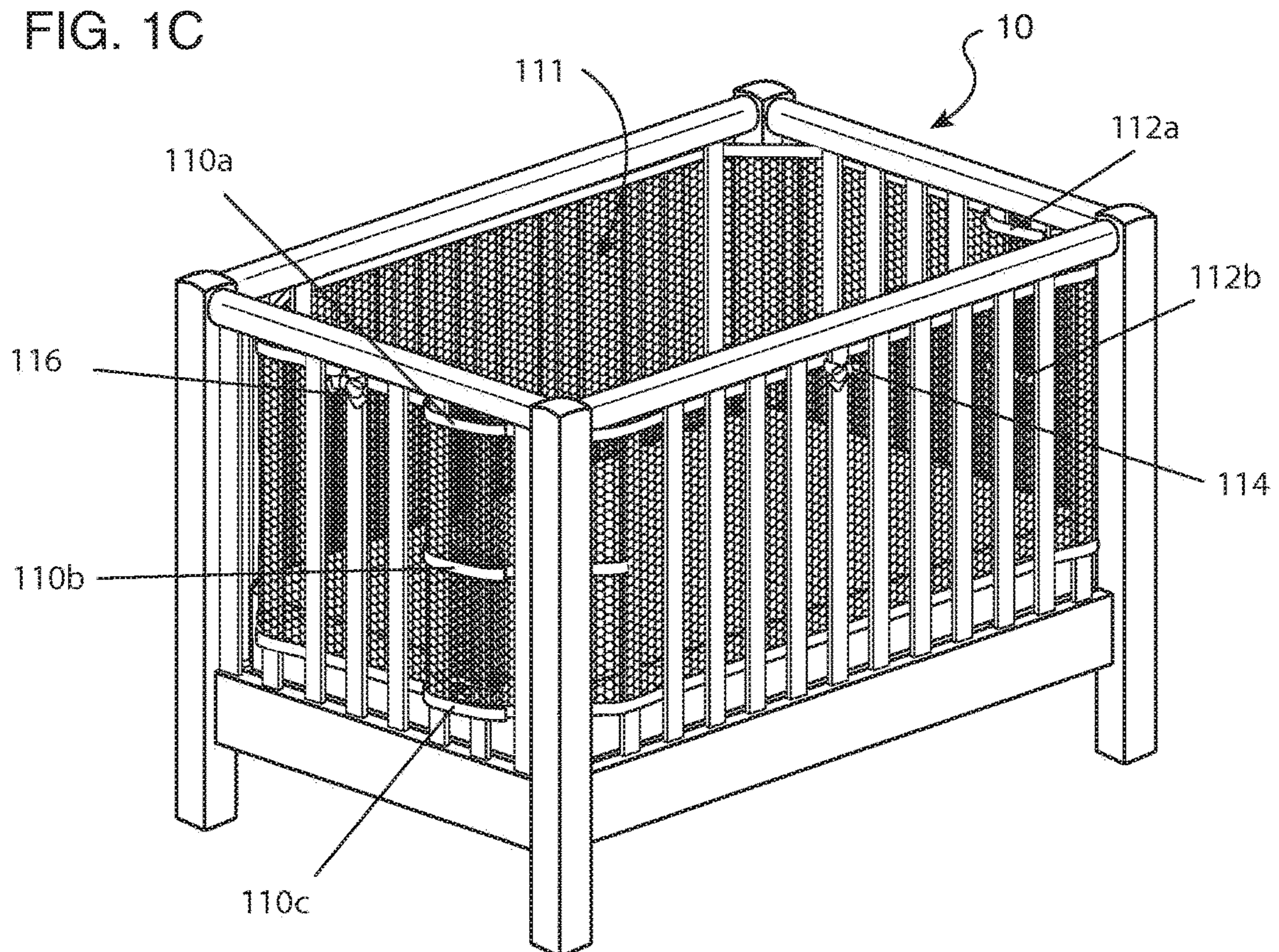


FIG. 1D

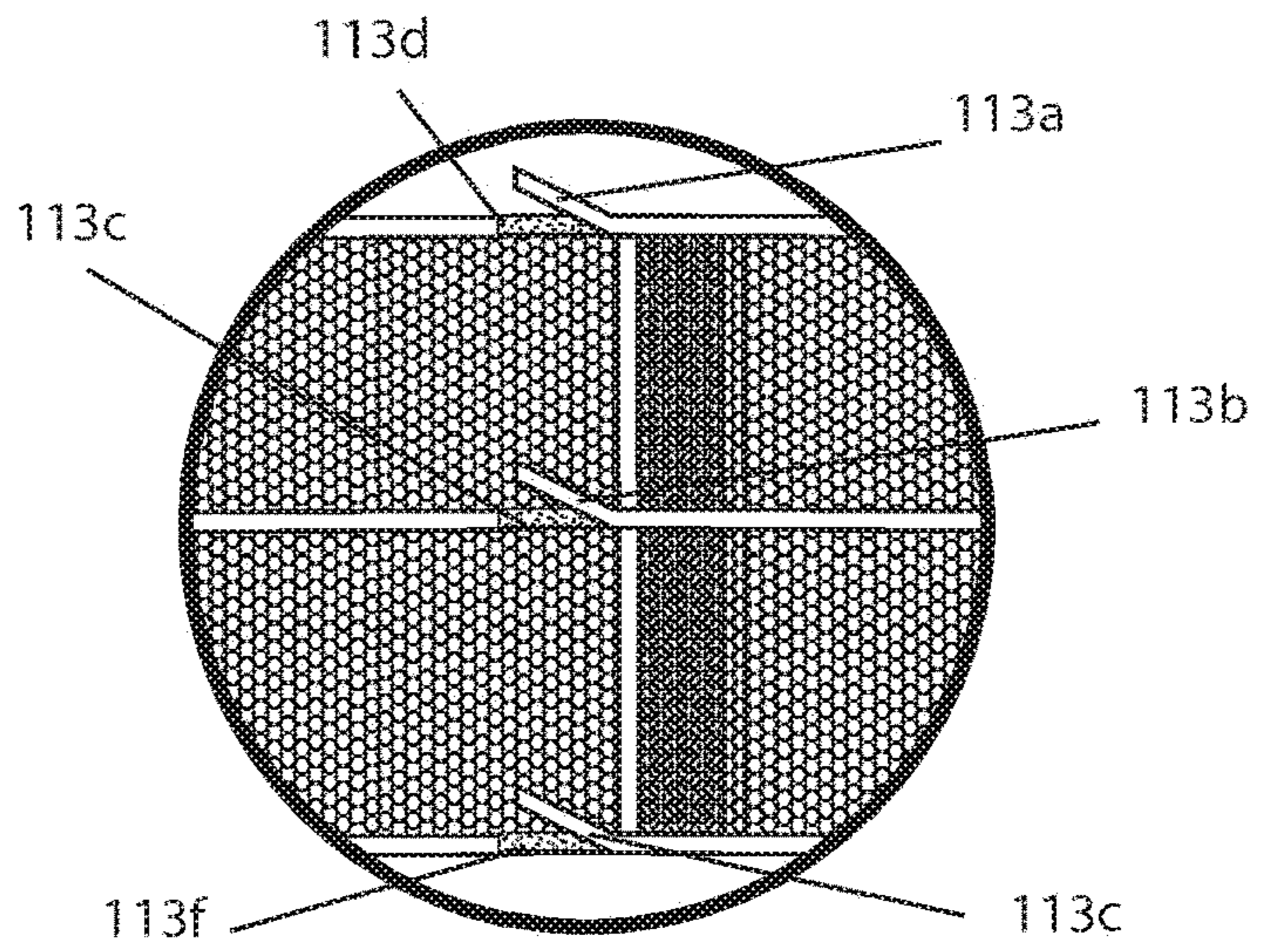


FIG. 1E

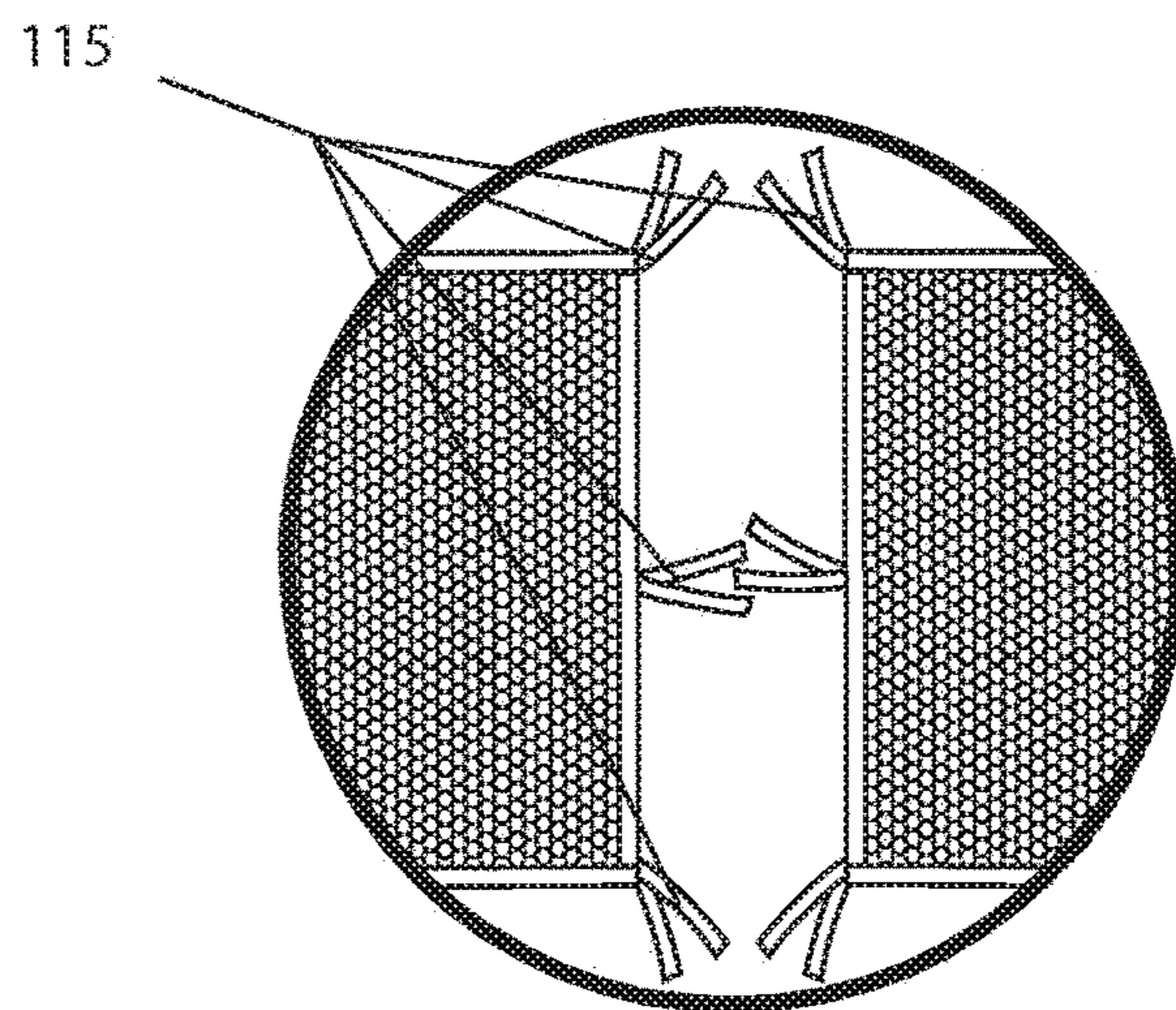


FIG. 1F

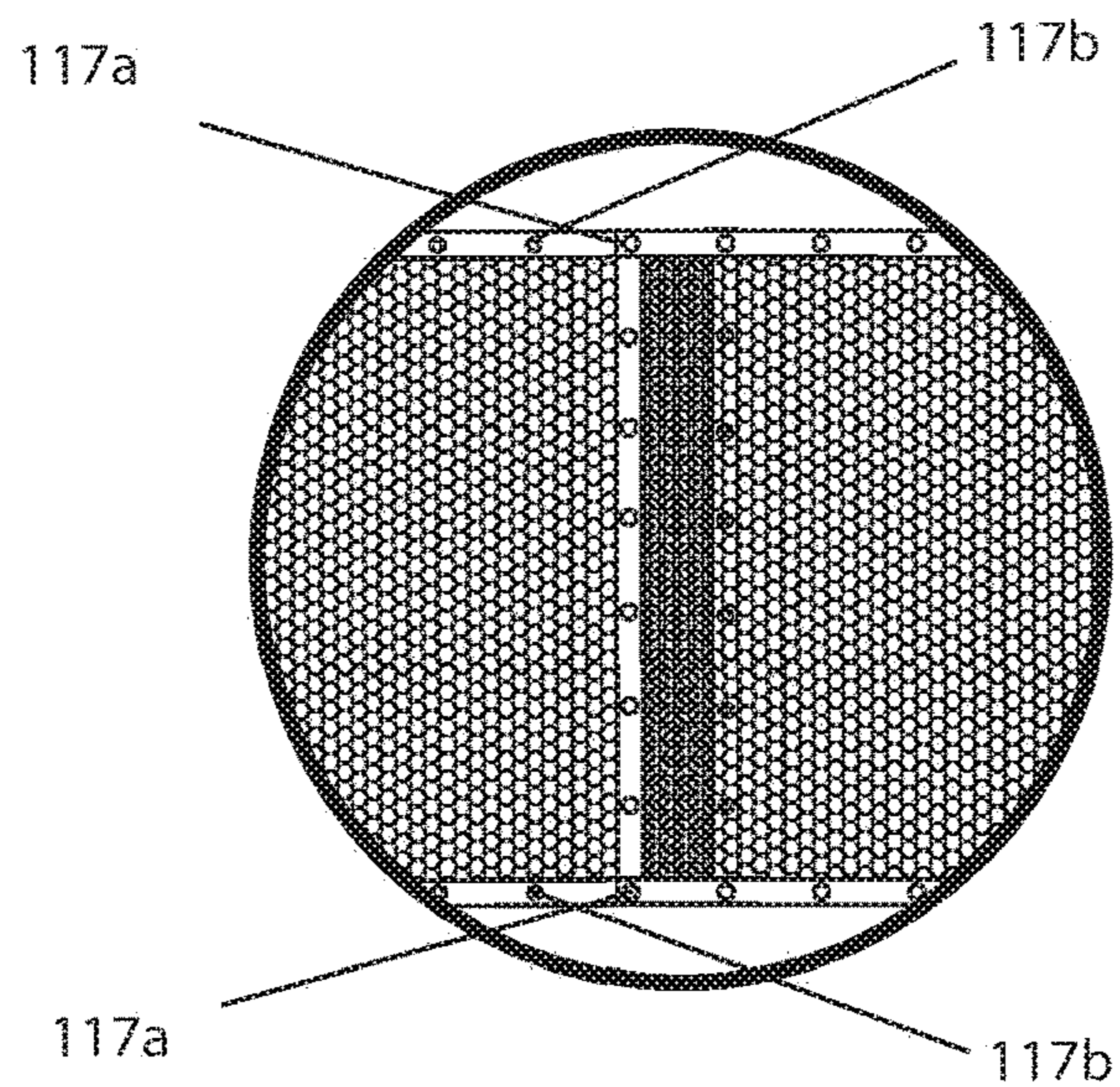


FIG. 2A

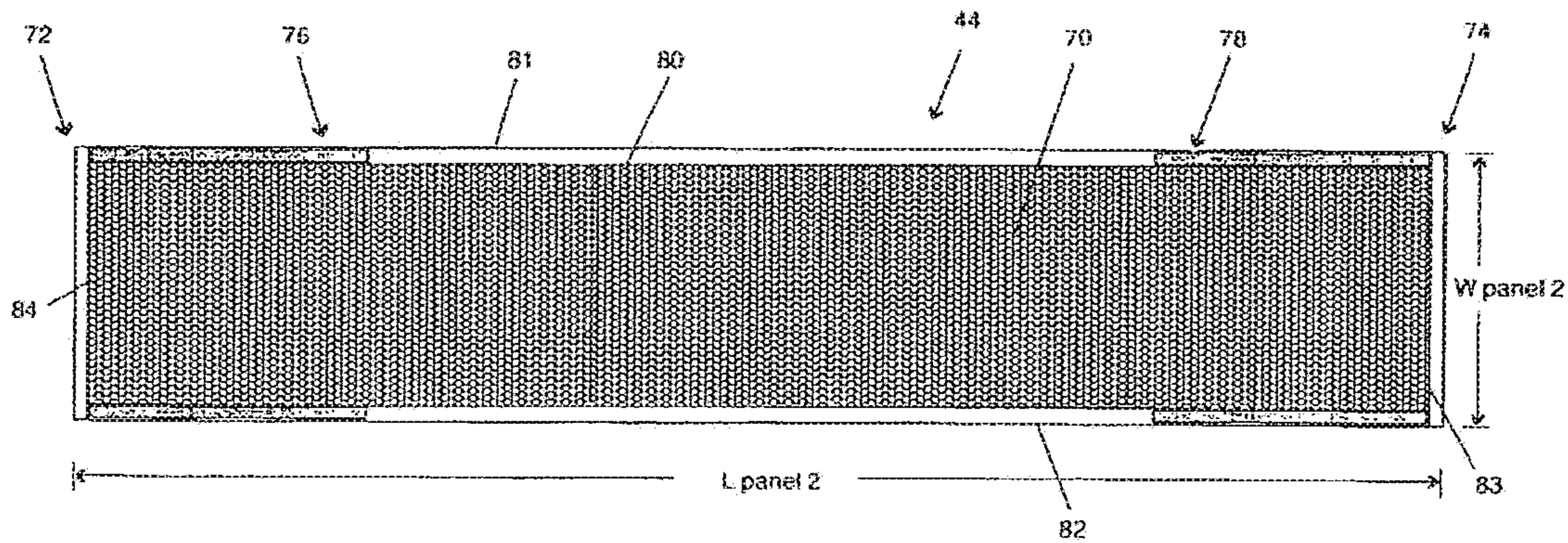
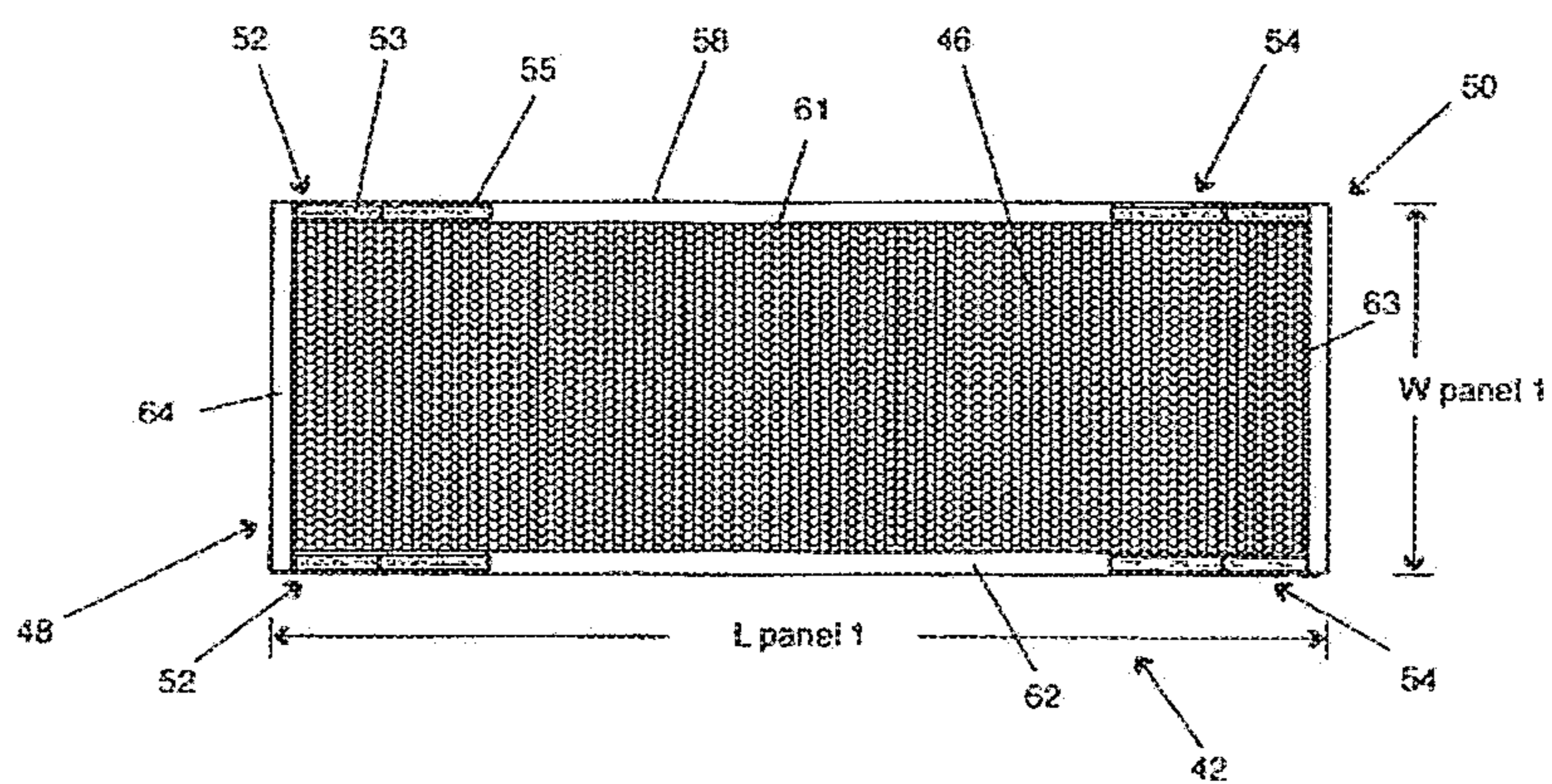


FIG. 2B

FIG. 2D

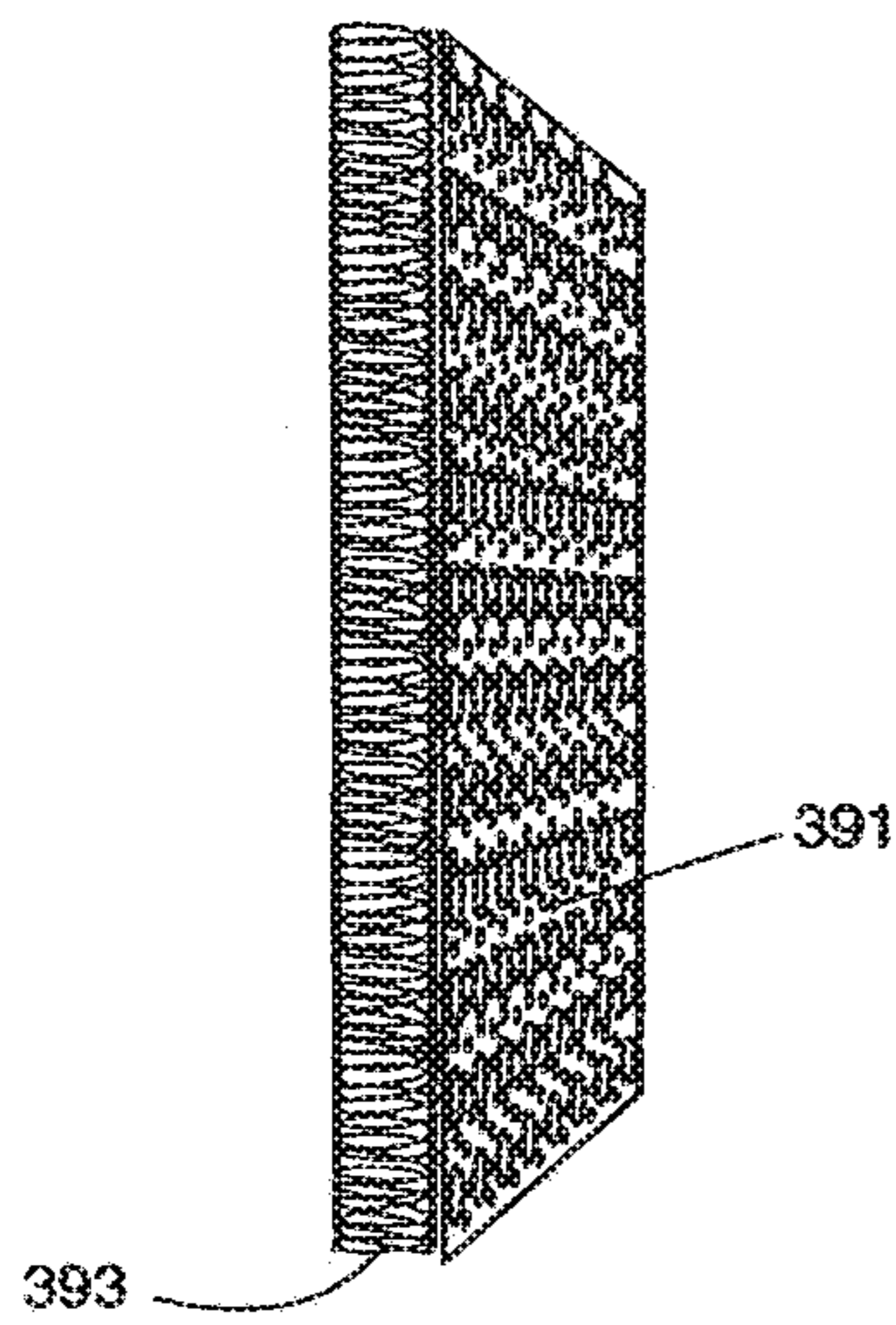


FIG. 2C

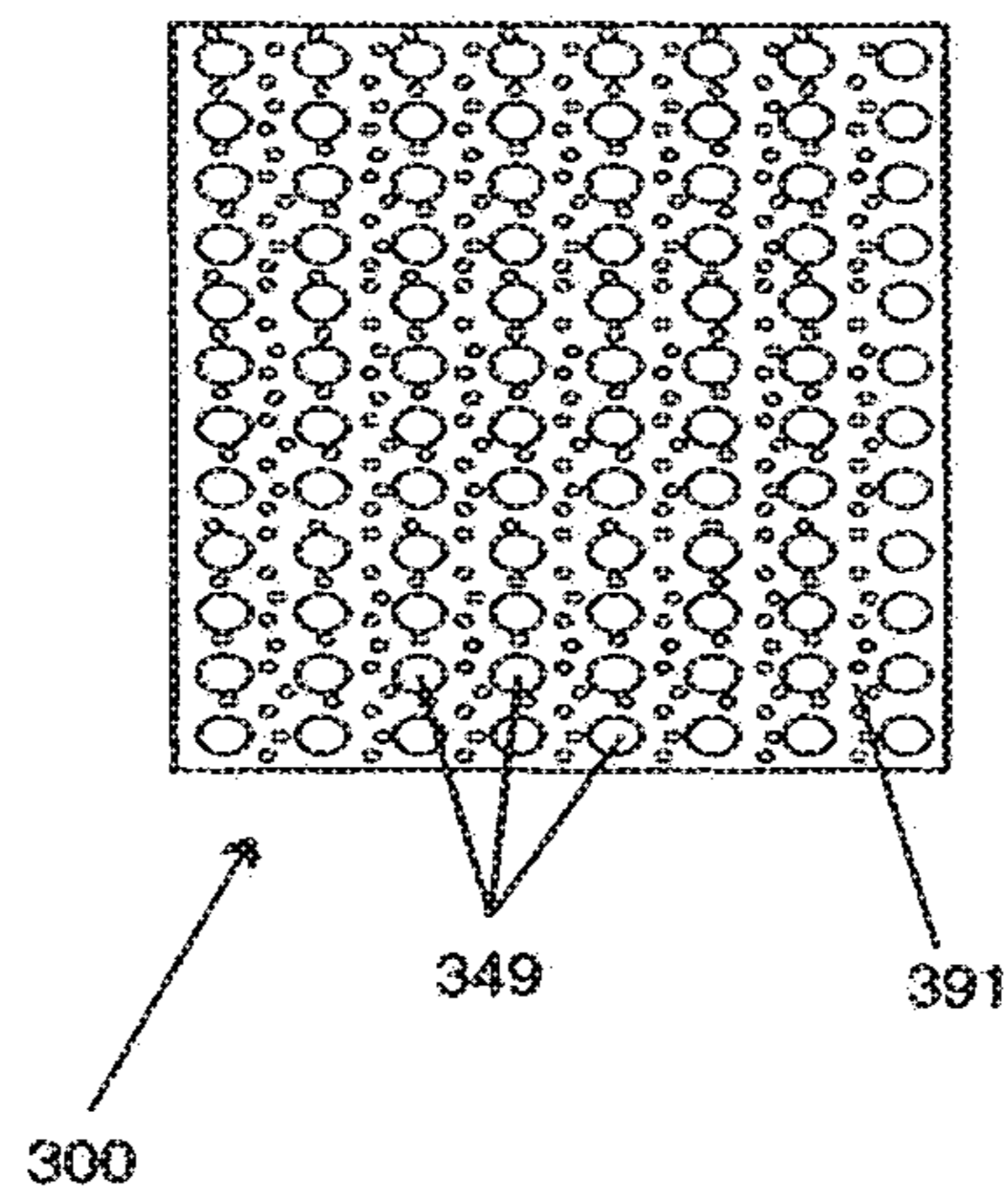


FIG. 2E

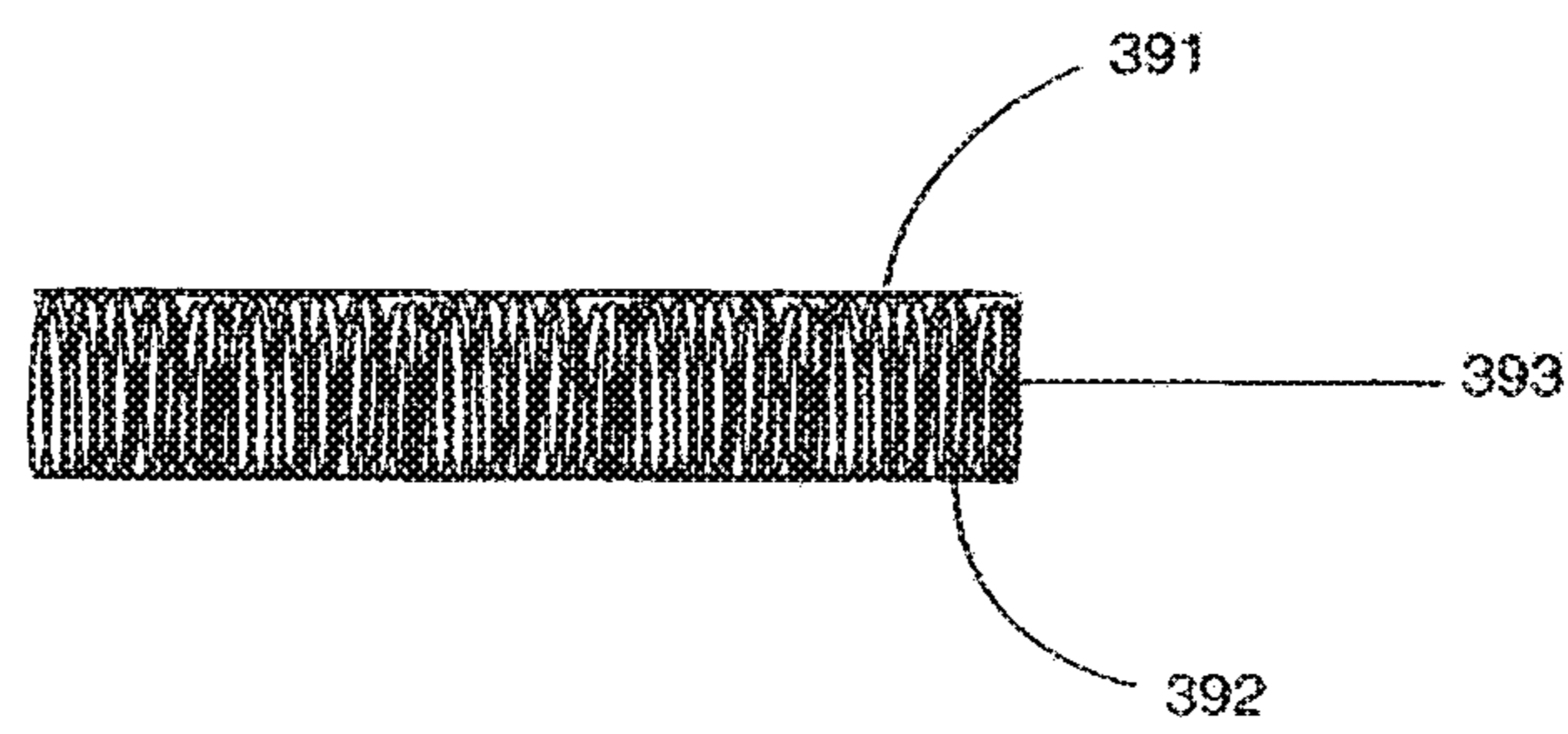
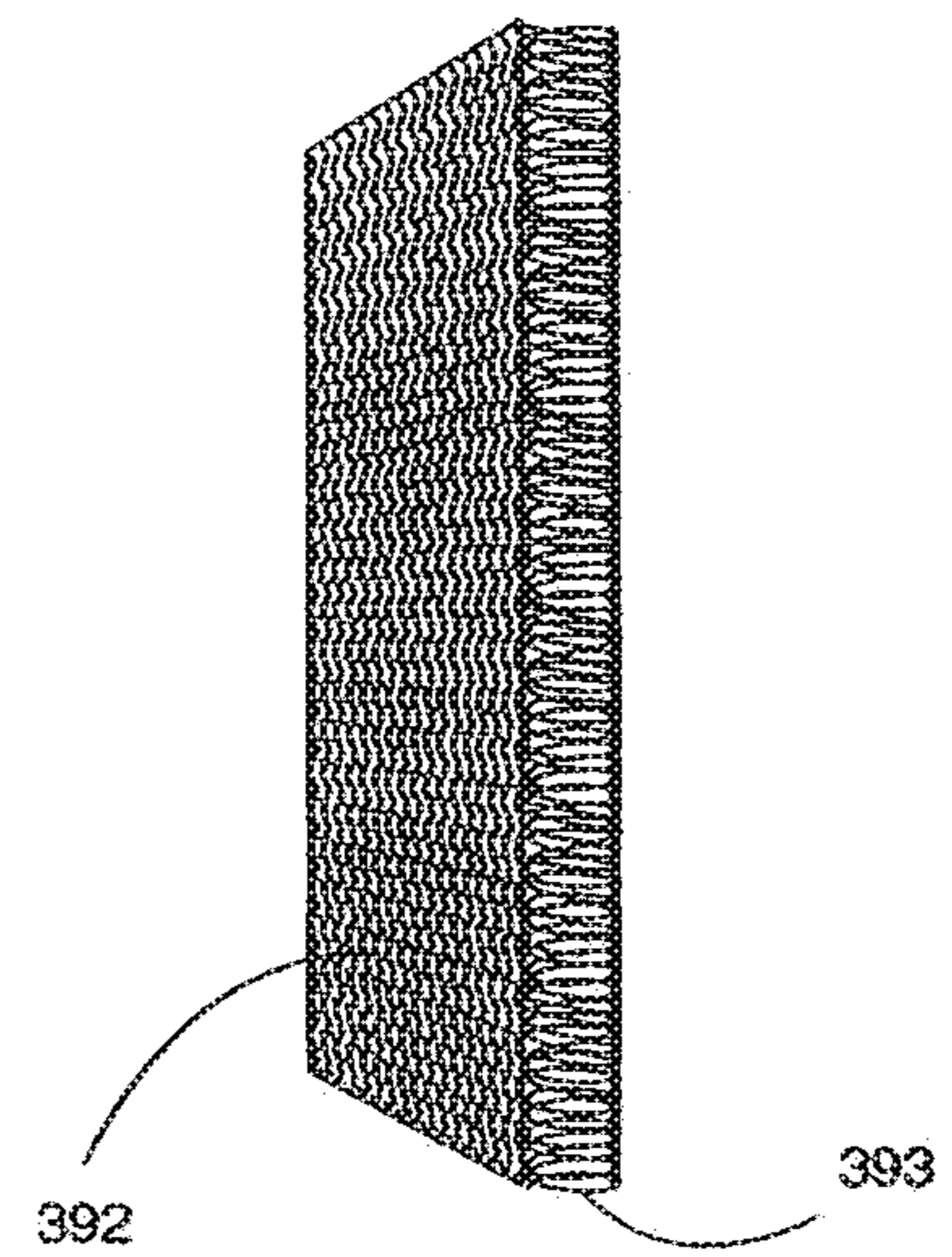


FIG. 2F



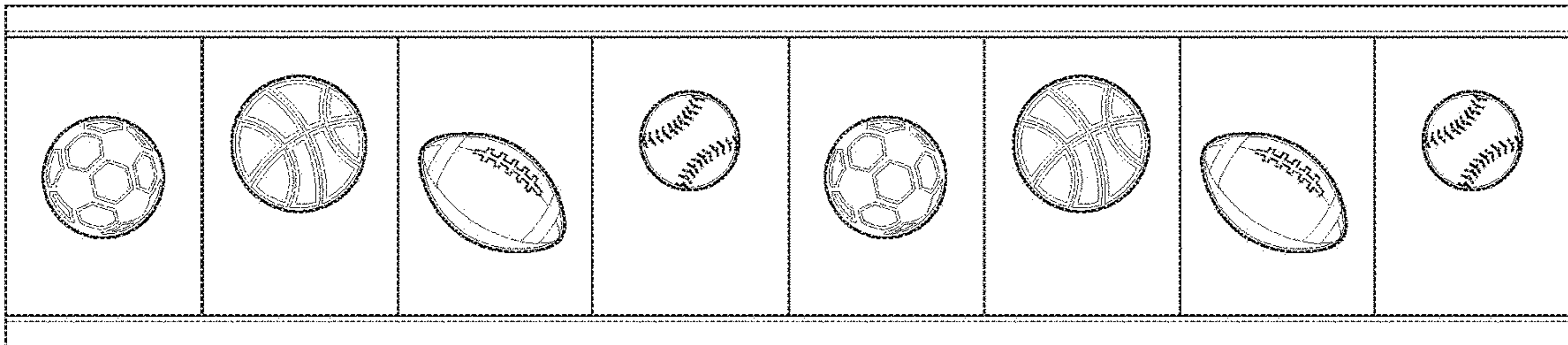


FIGURE 2G

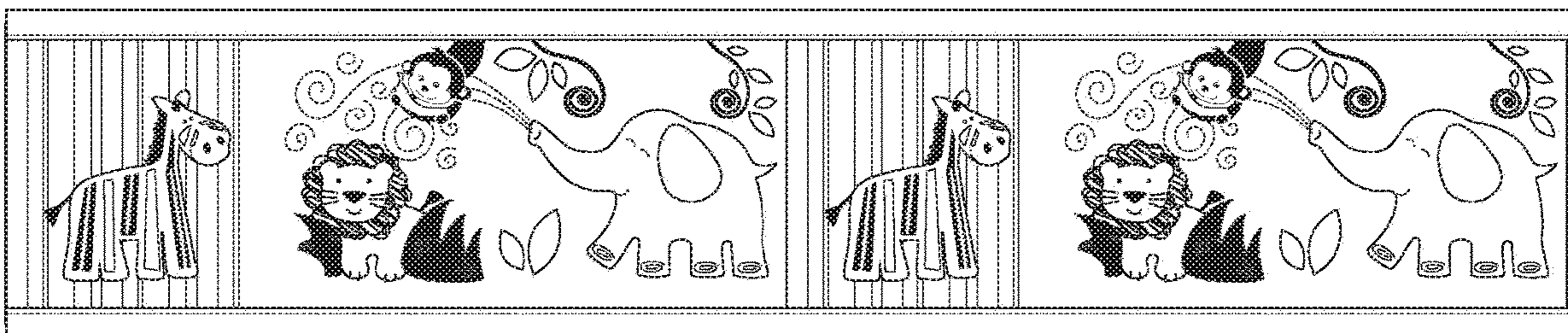


FIGURE 2H

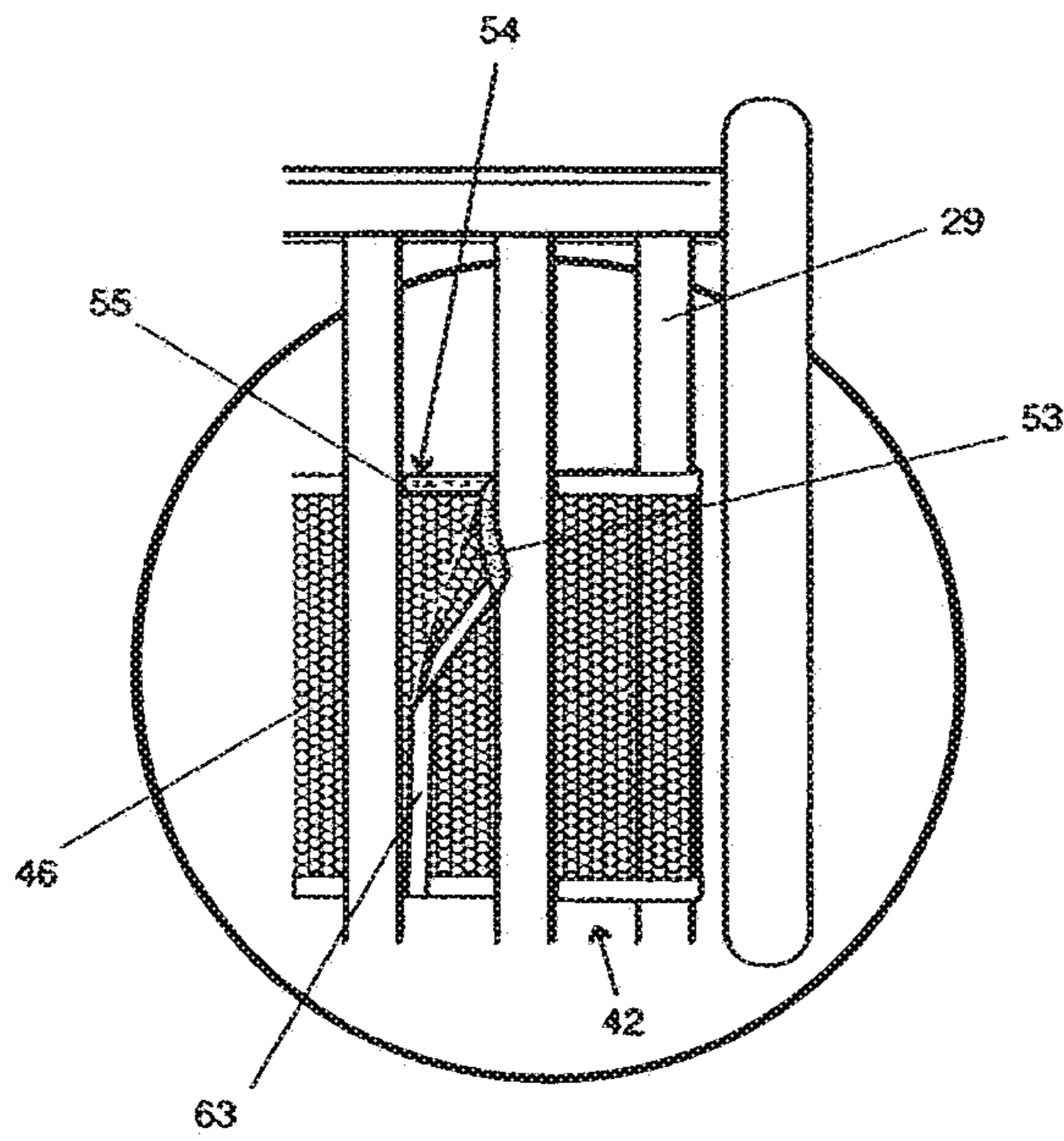


FIG. 3A

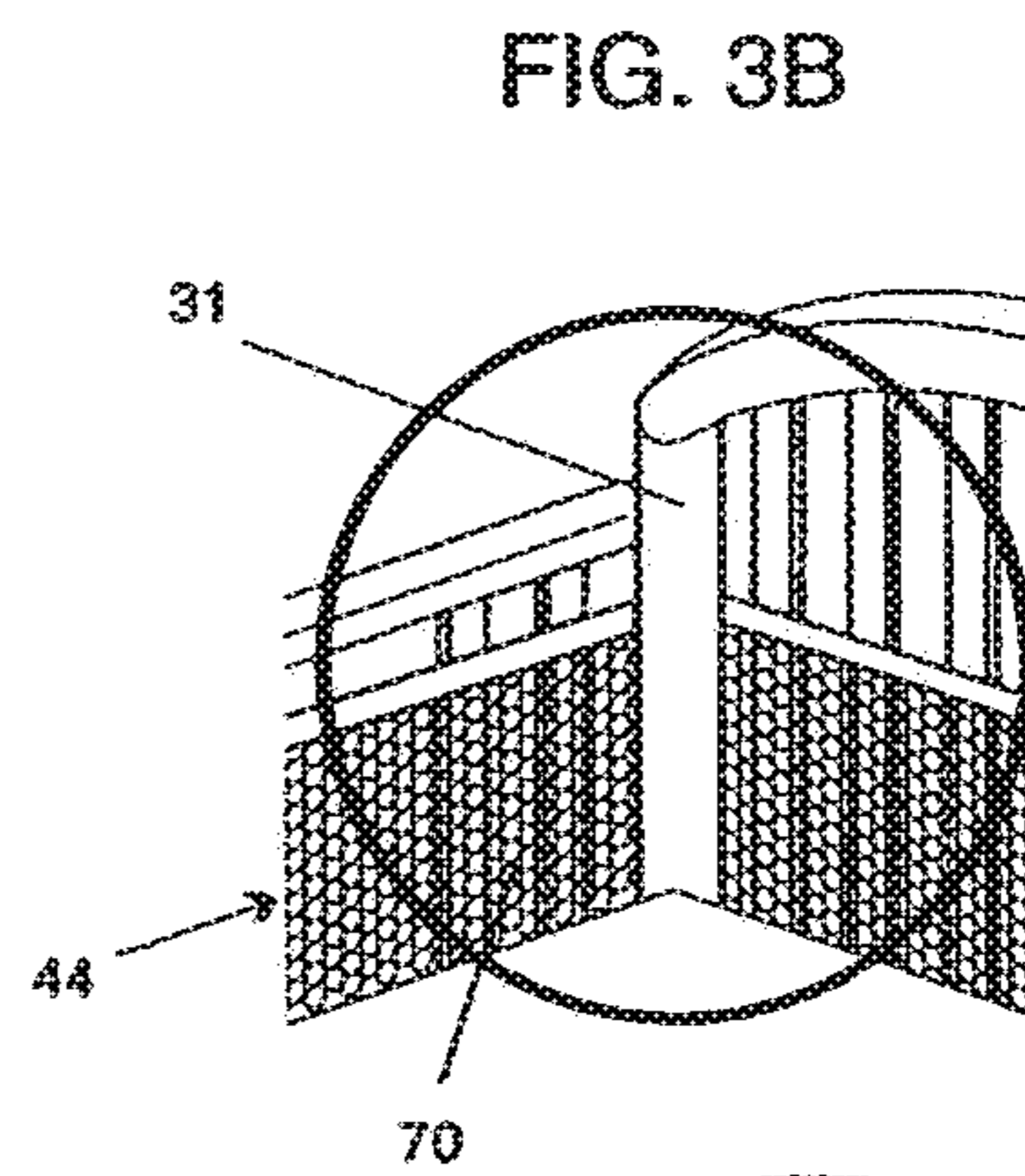


FIG. 3B

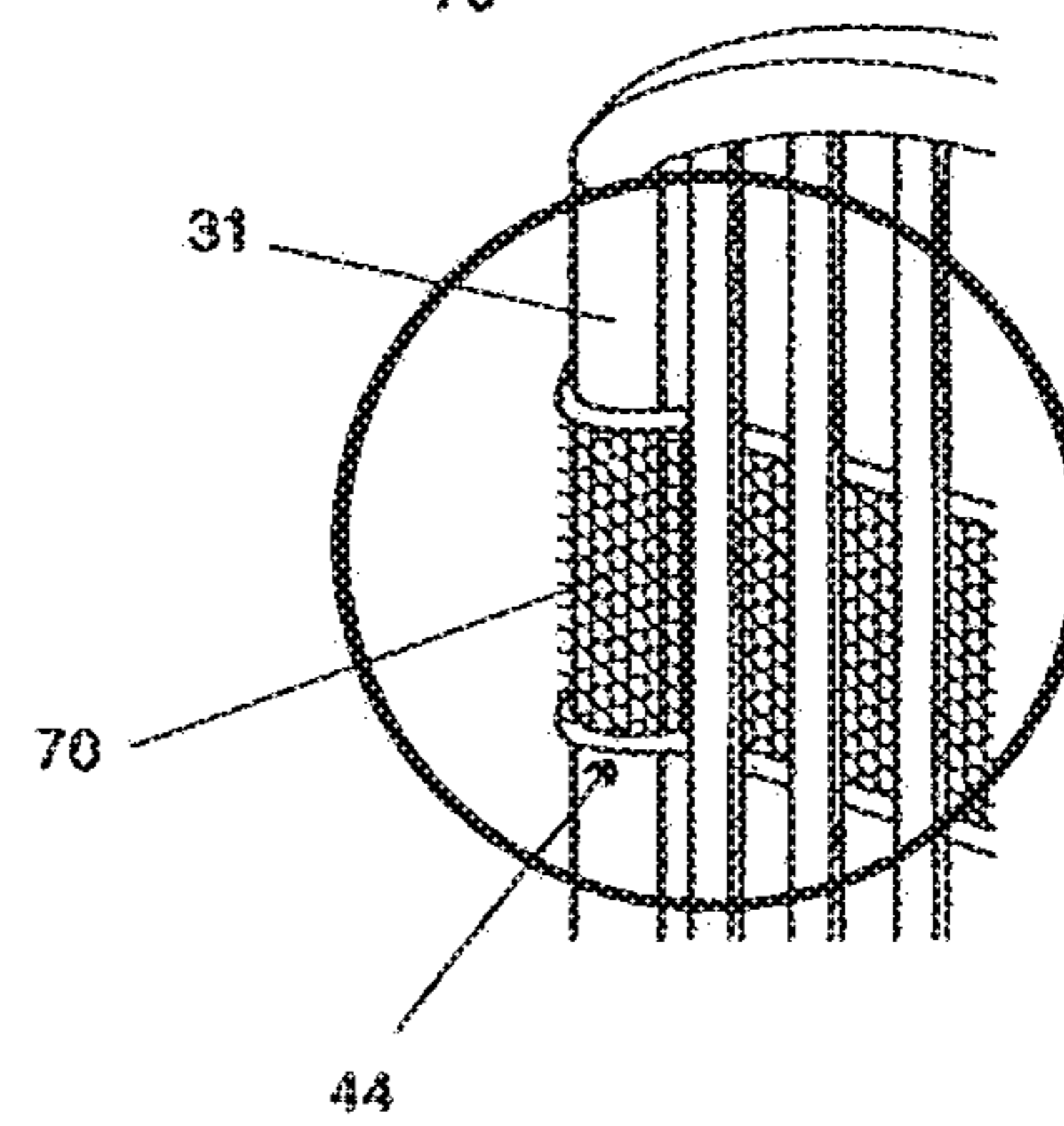


FIG. 3C

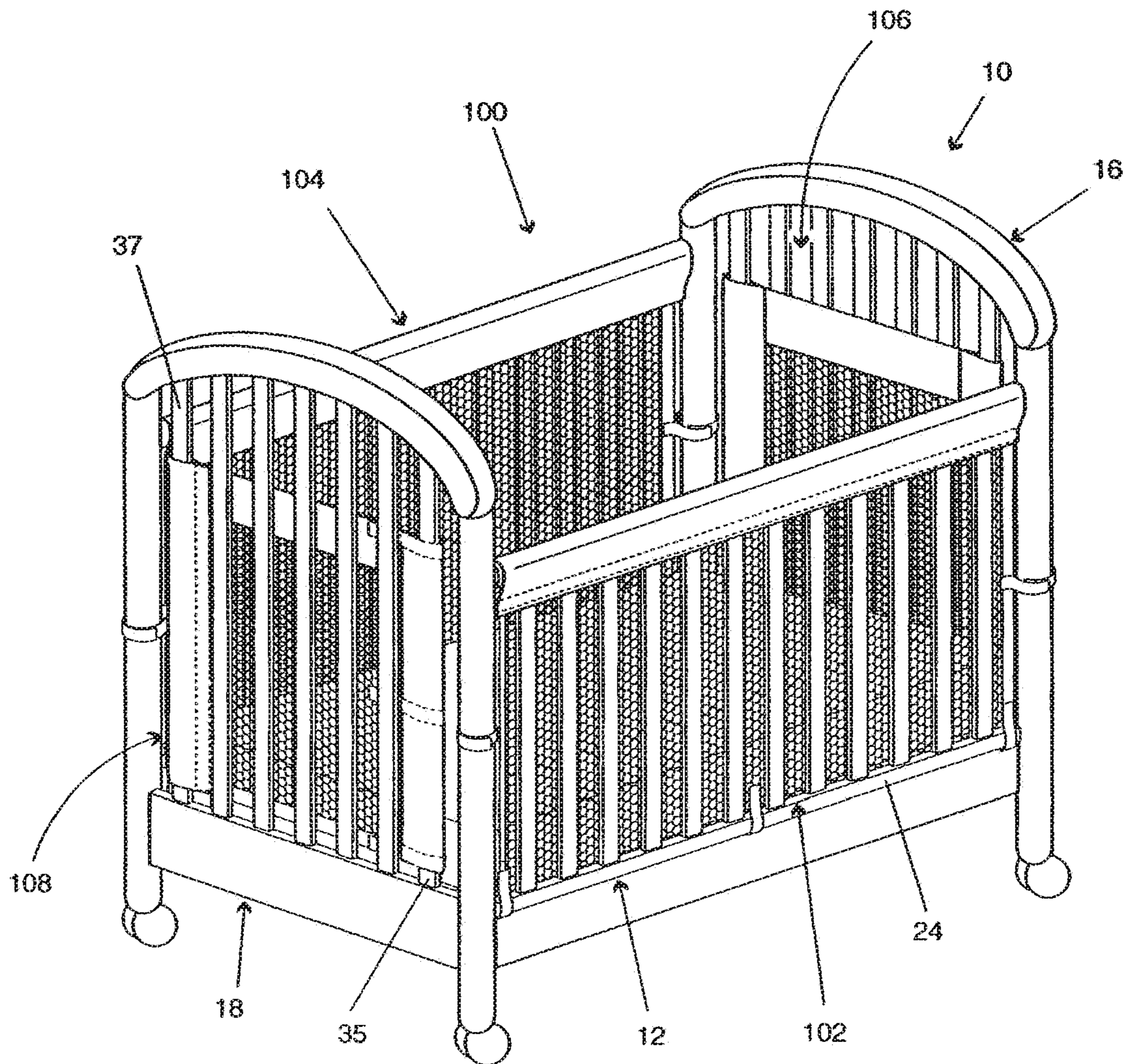


FIG. 4A

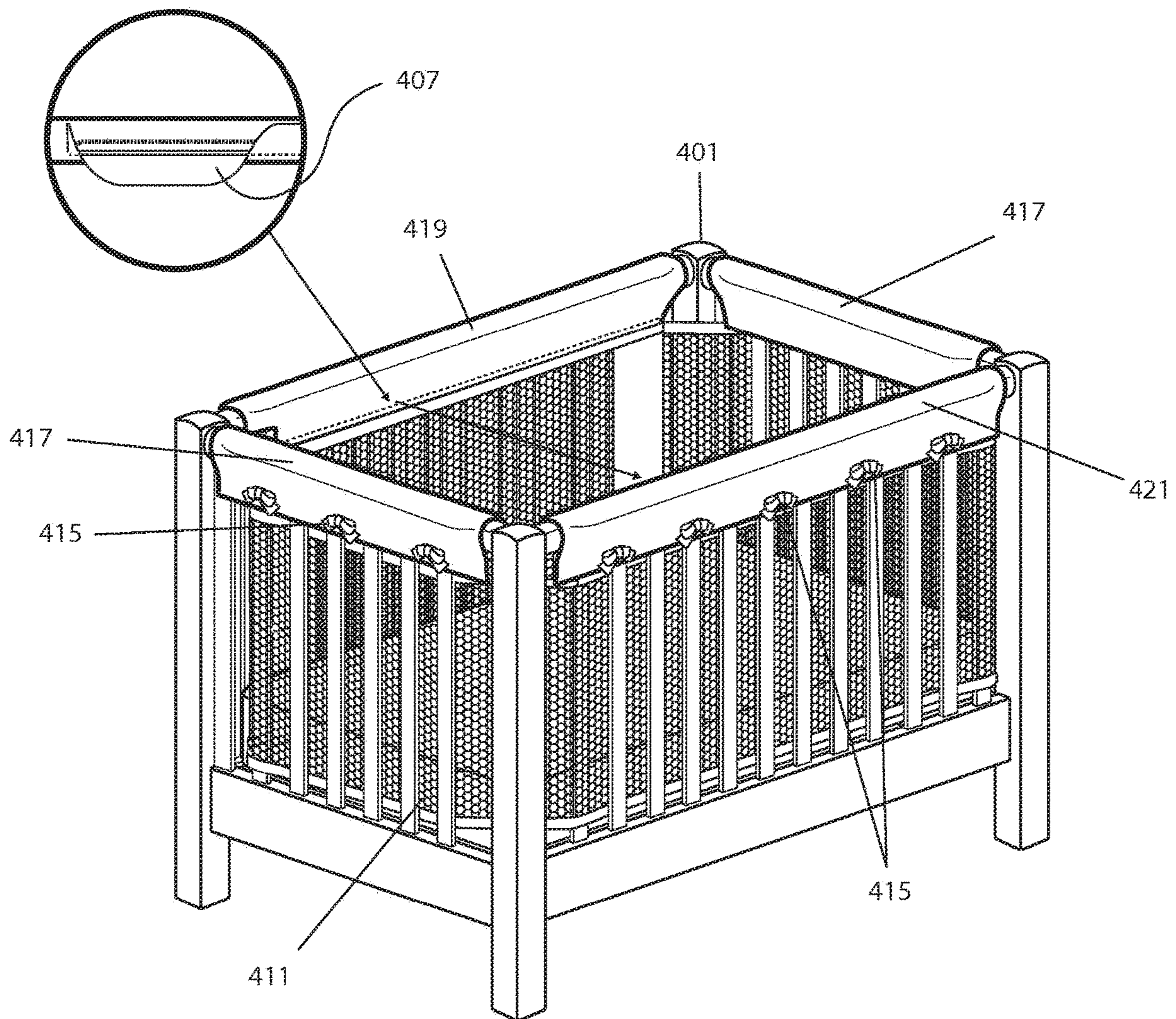
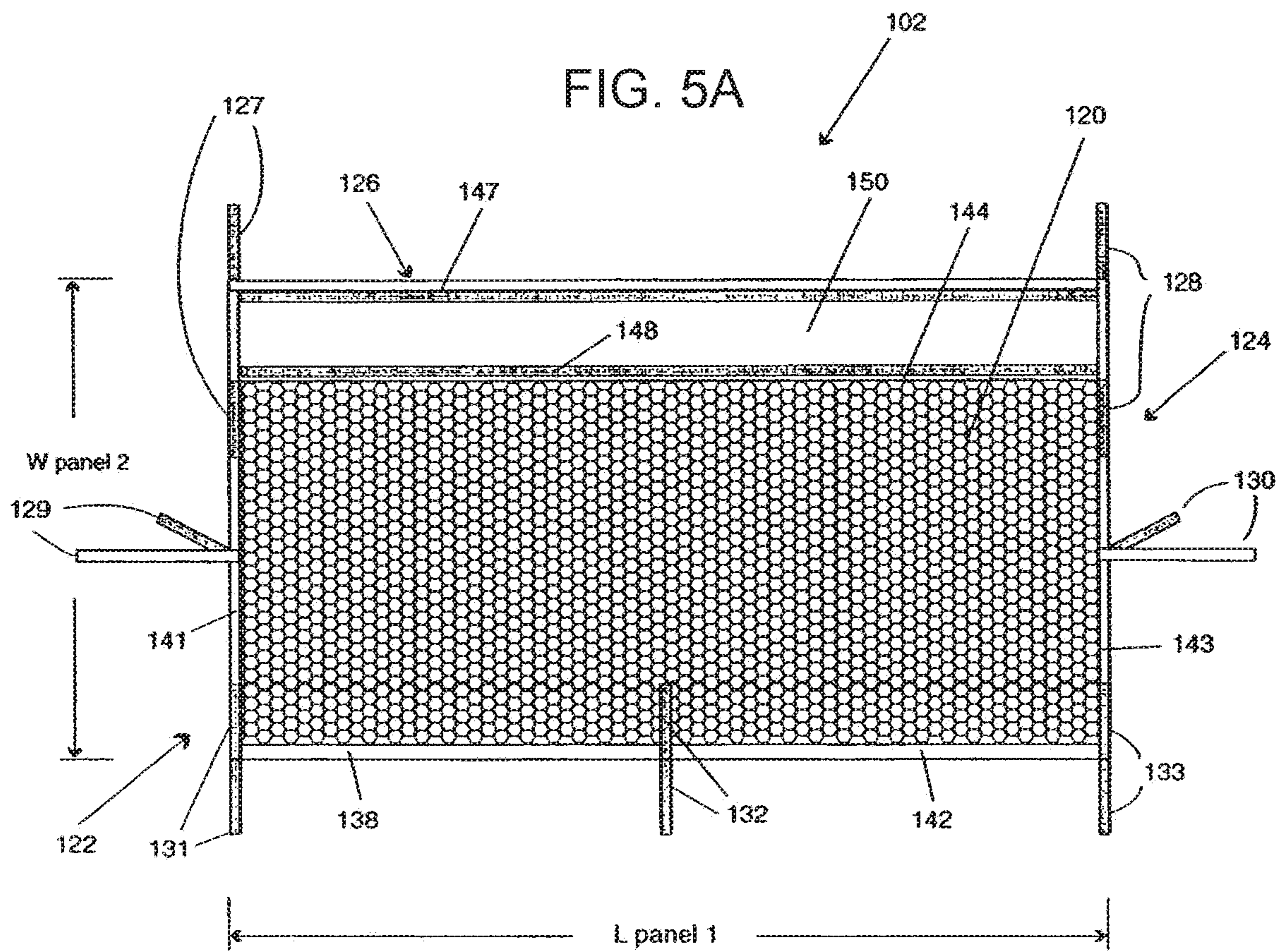


FIG. 4B



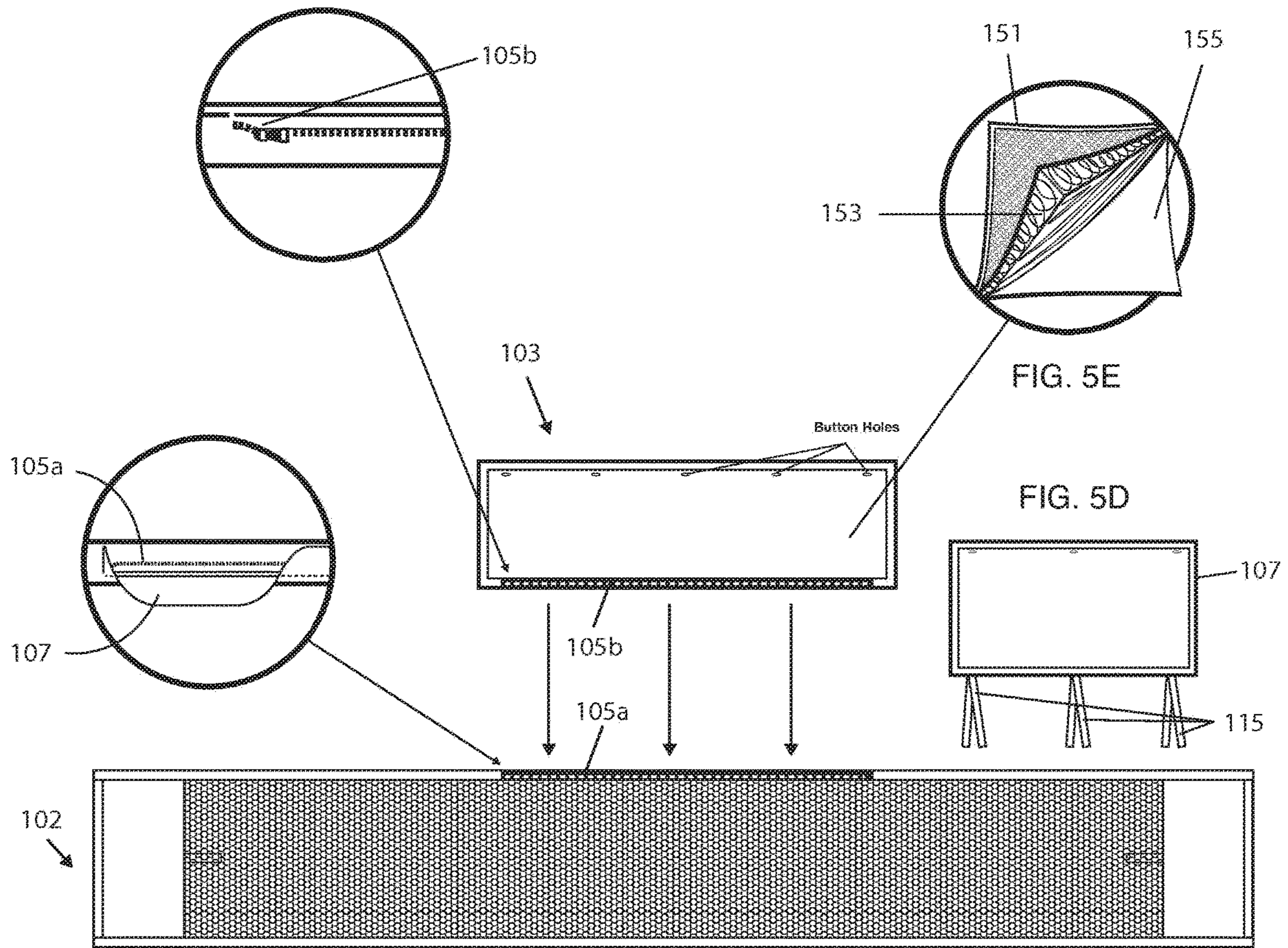


FIG. 5C

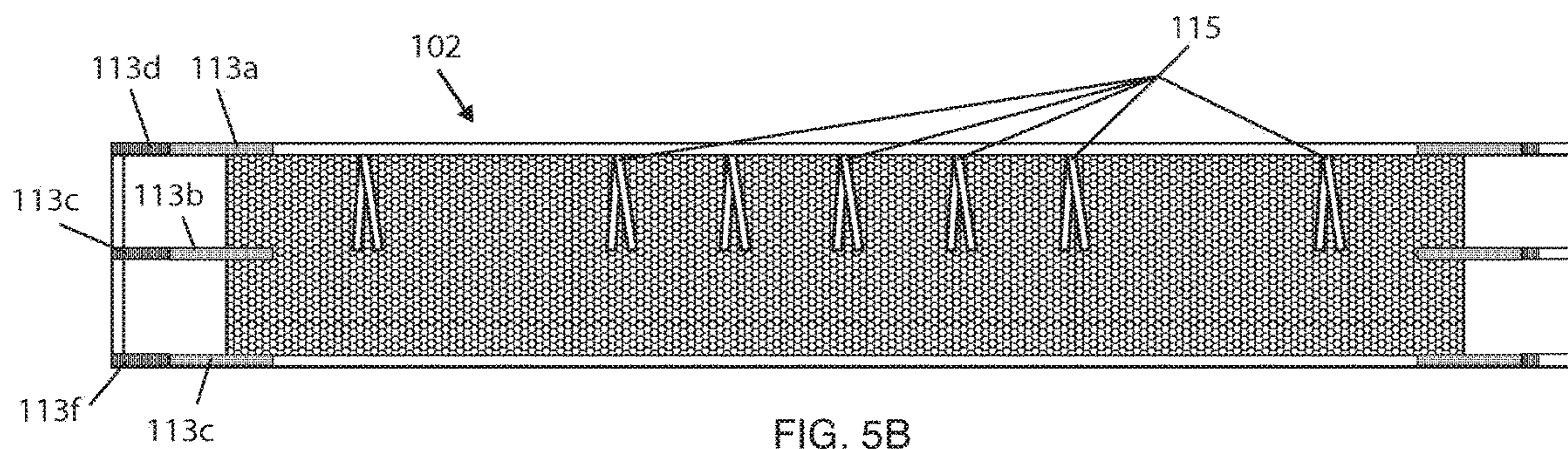


FIG. 5B

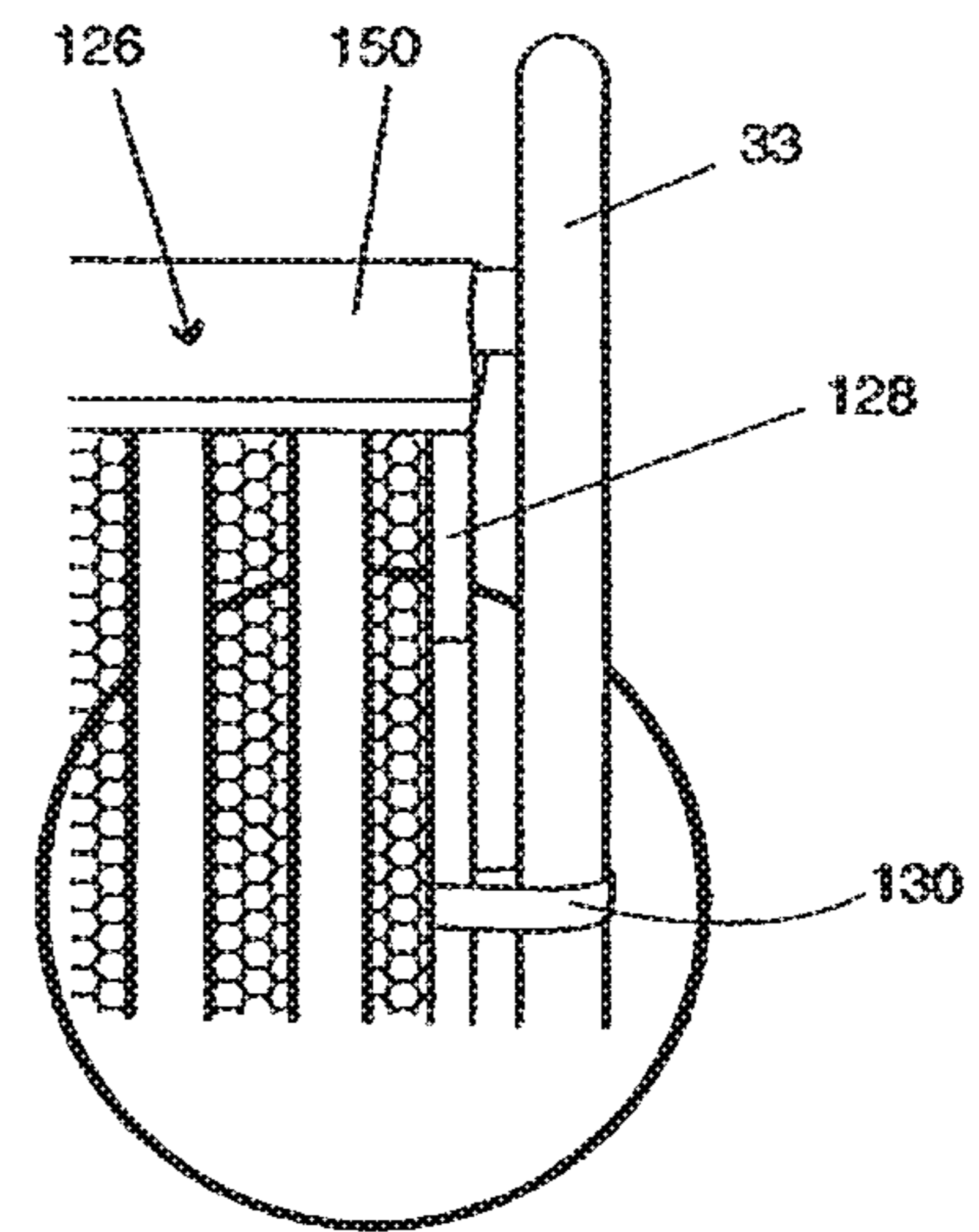
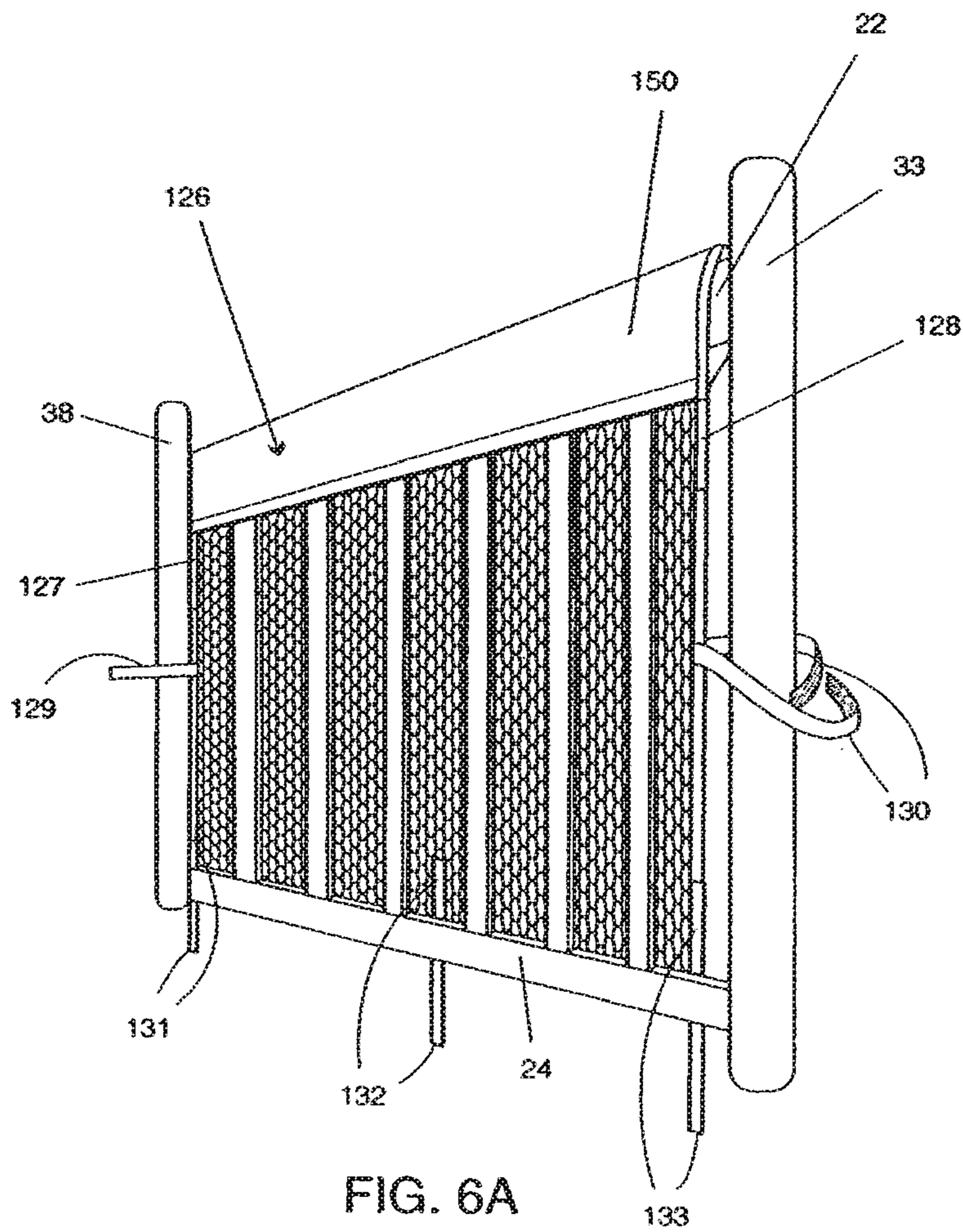


FIG. 6C

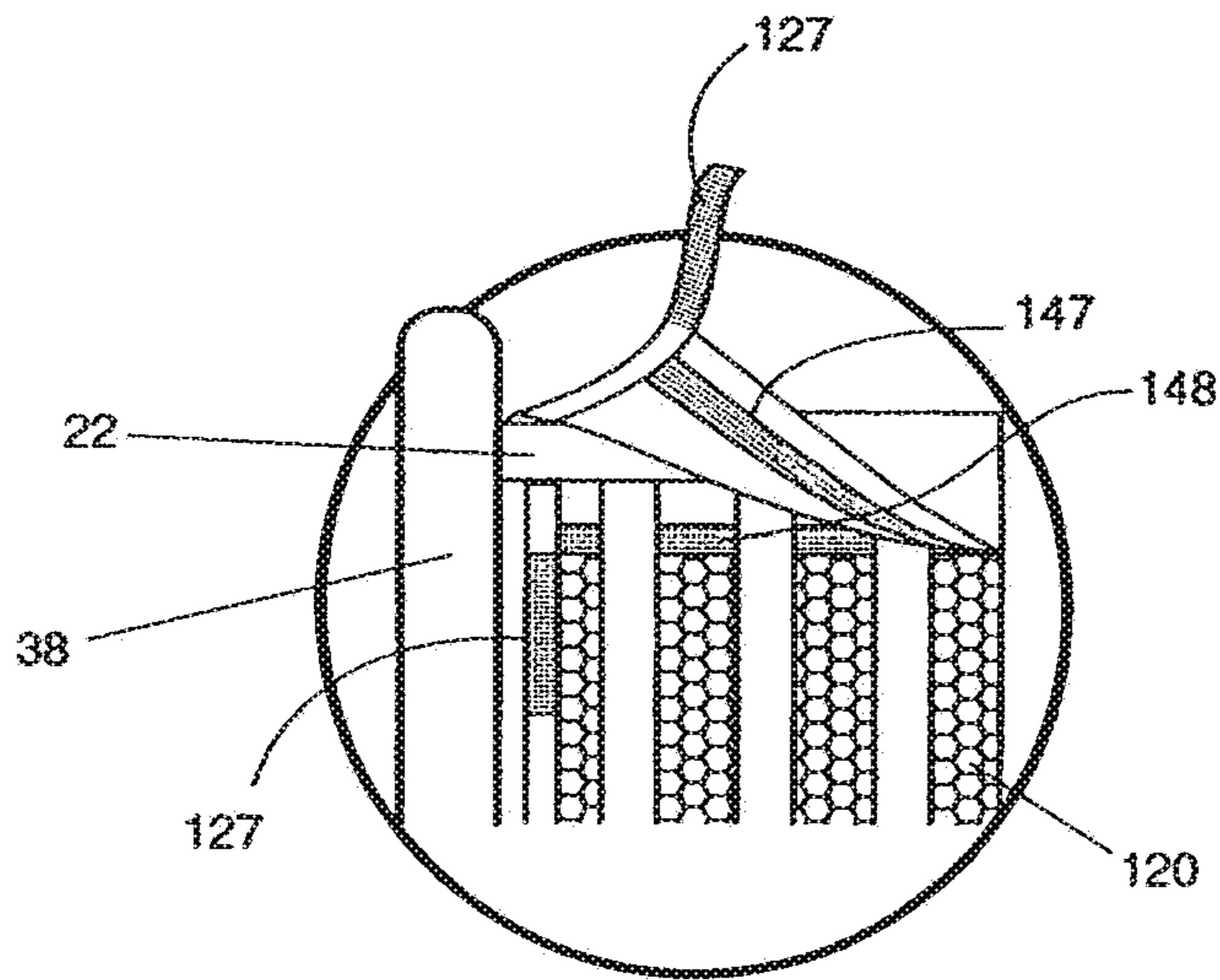


FIG. 6D

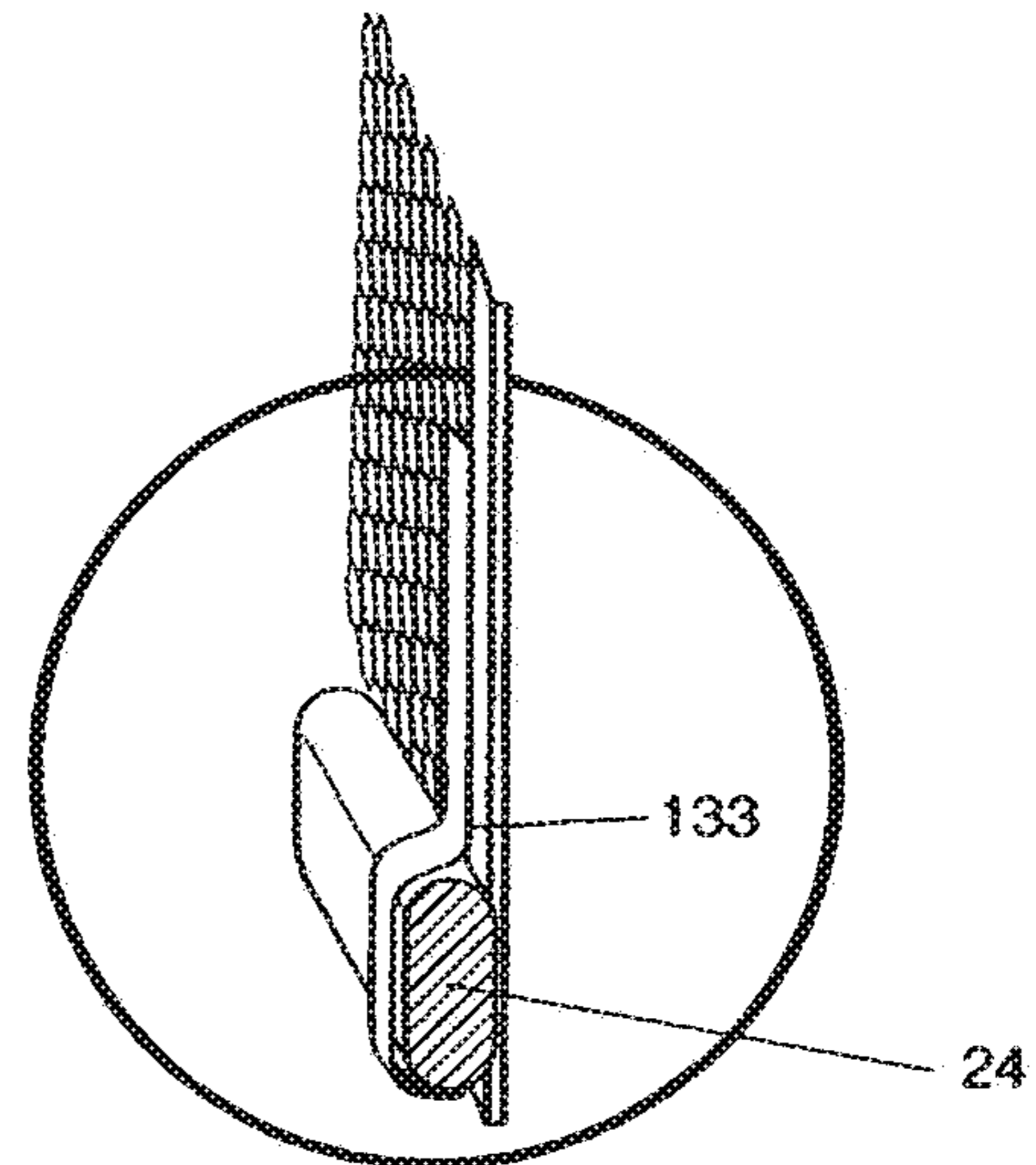
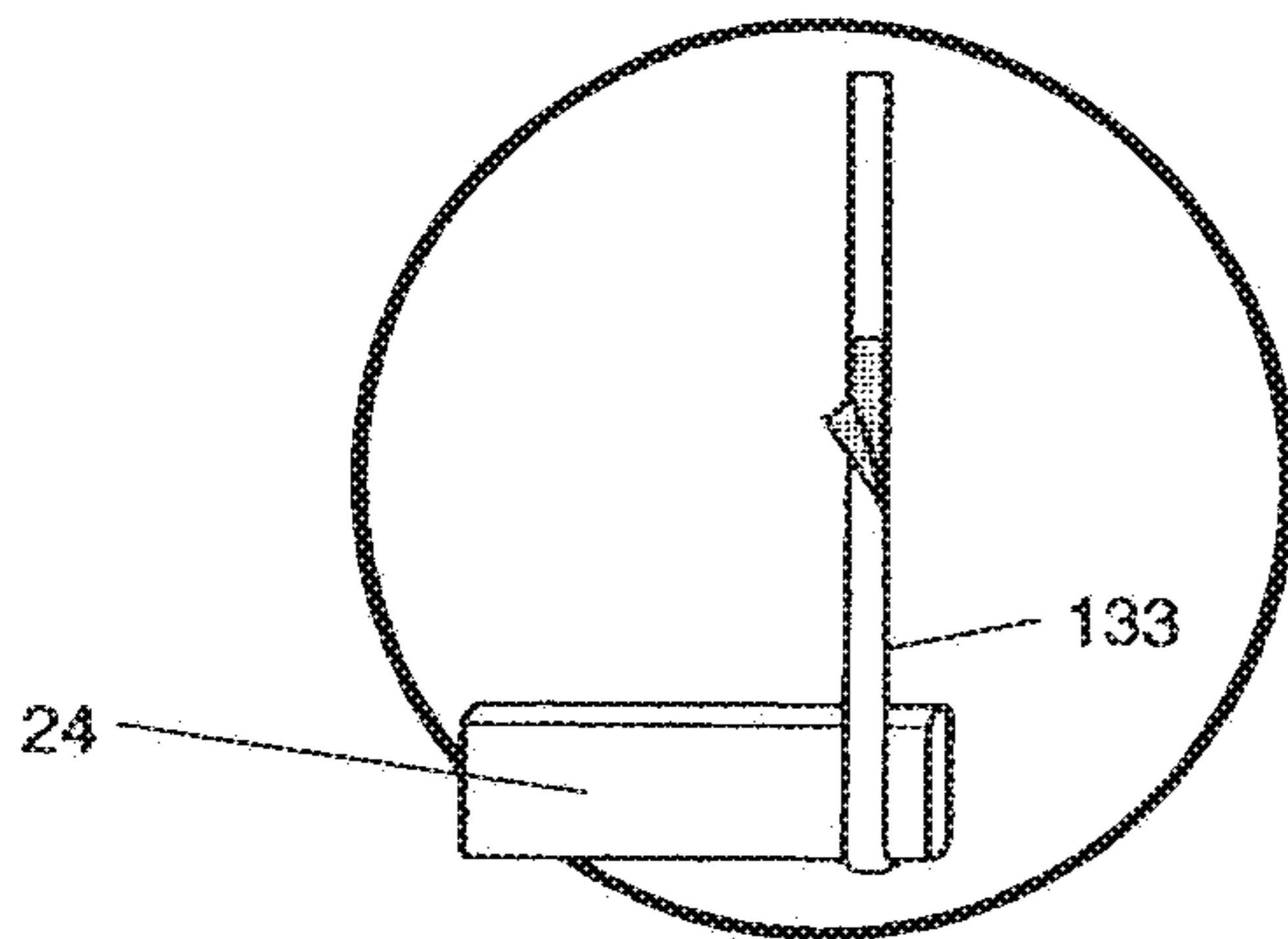
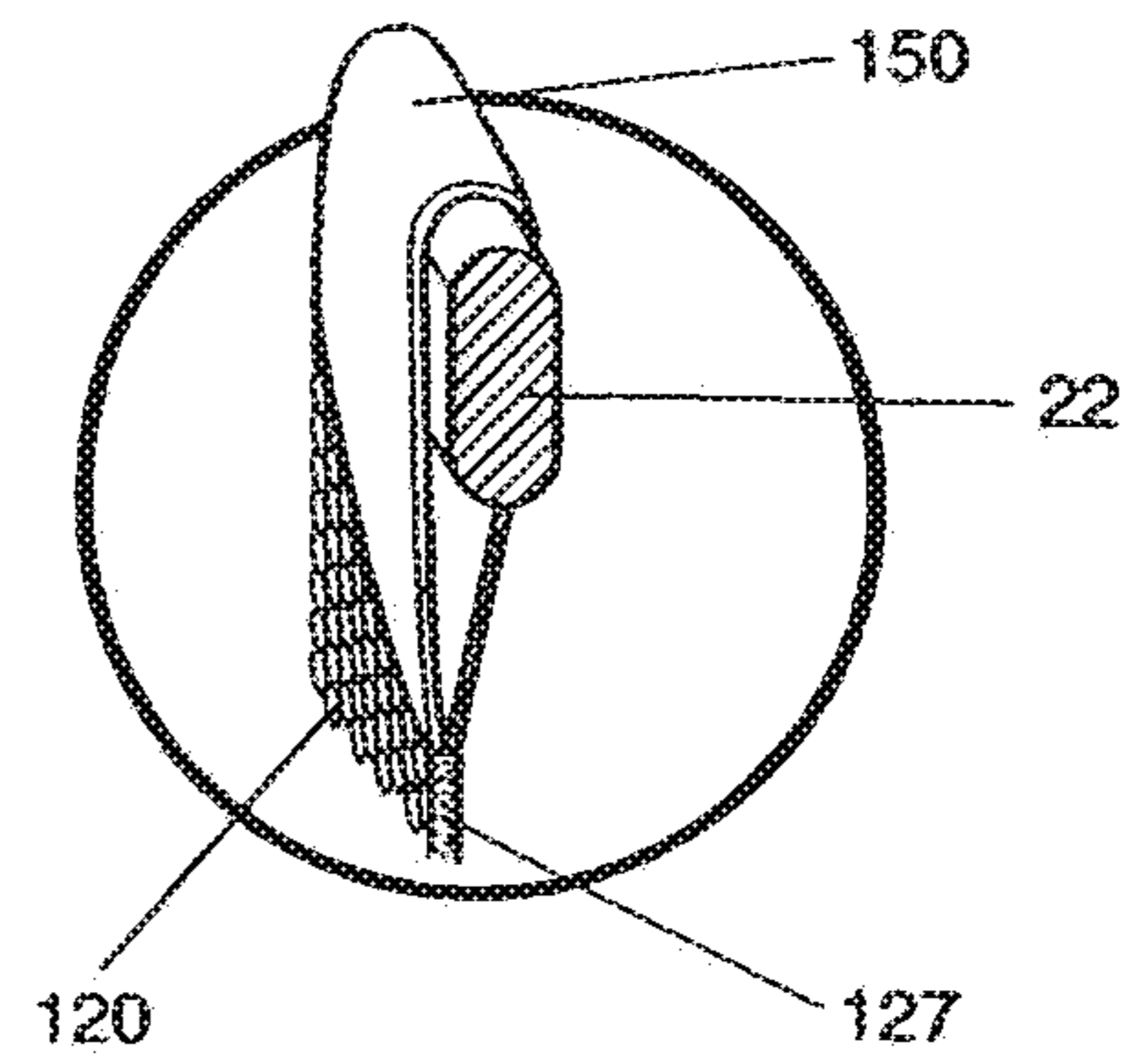


FIG. 6E

FIG. 6F



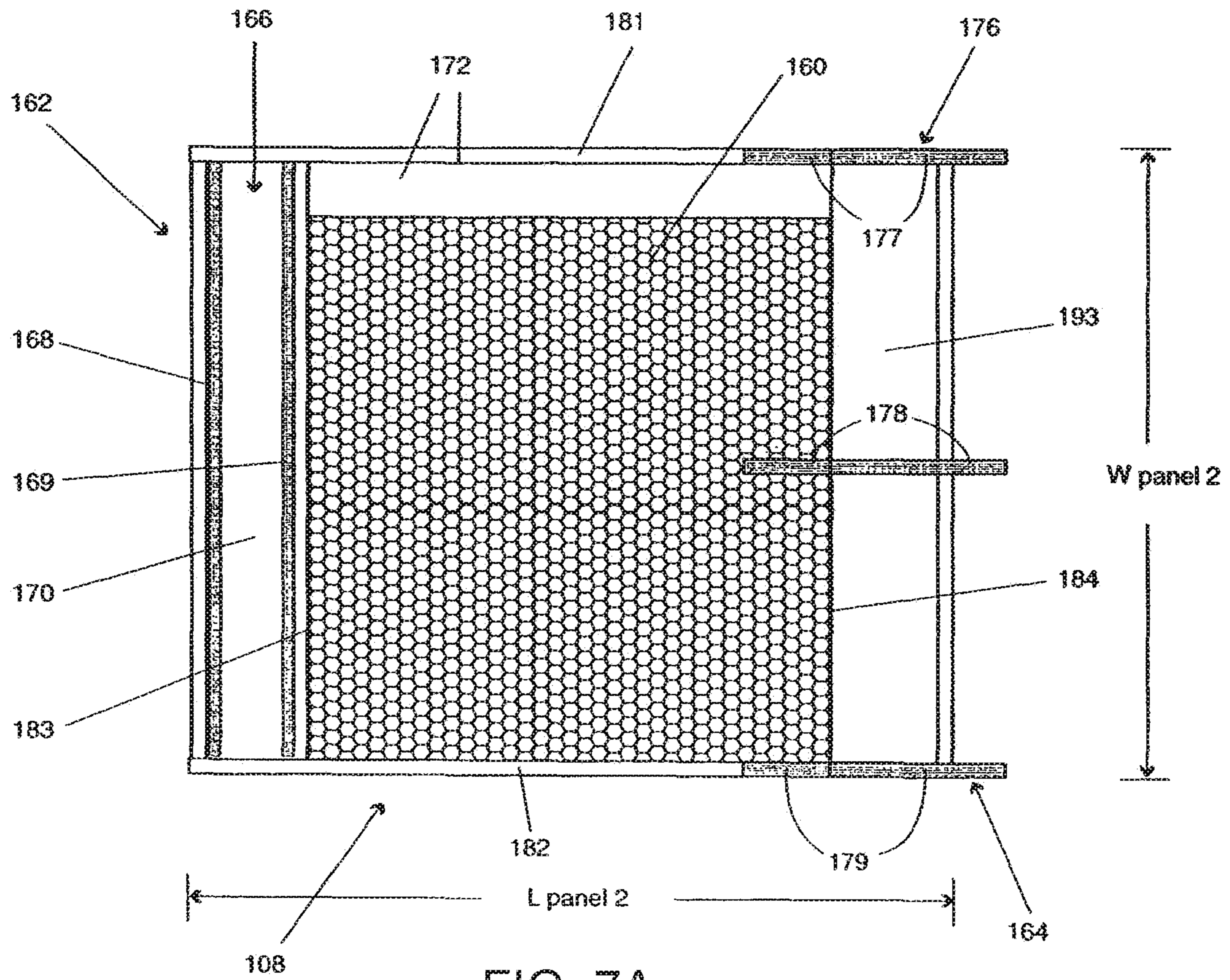


FIG. 7A

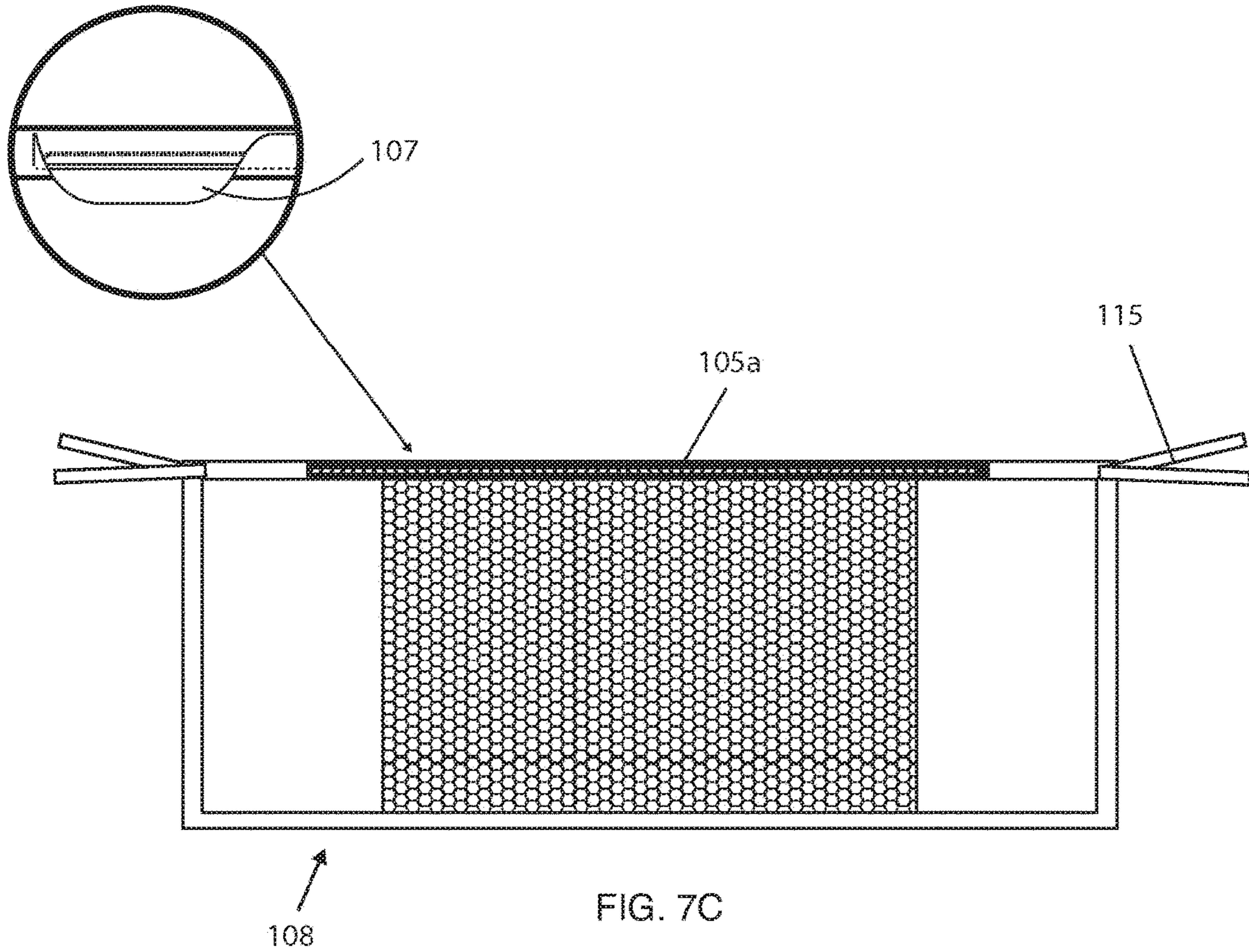


FIG. 7C

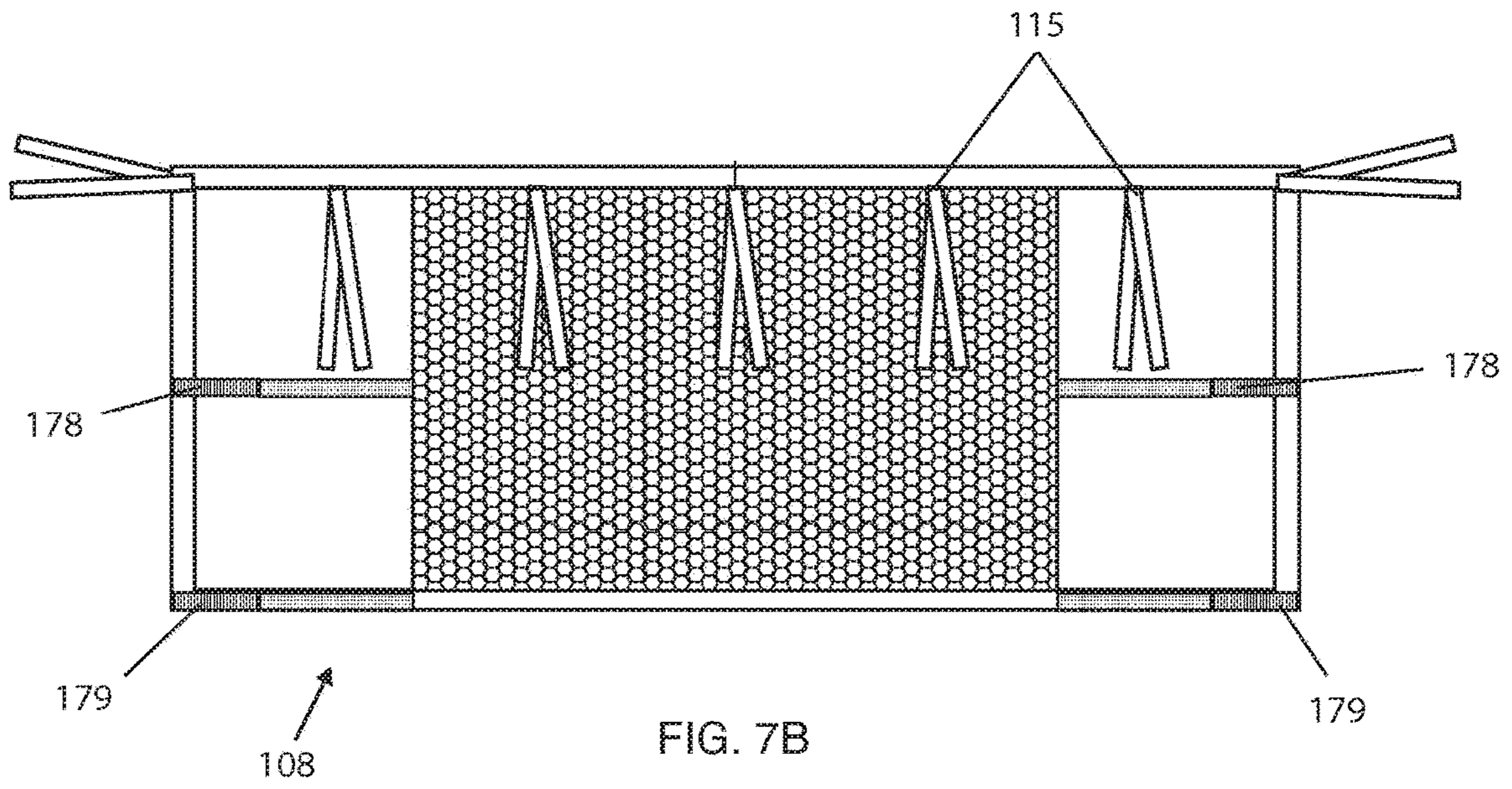


FIG. 7B

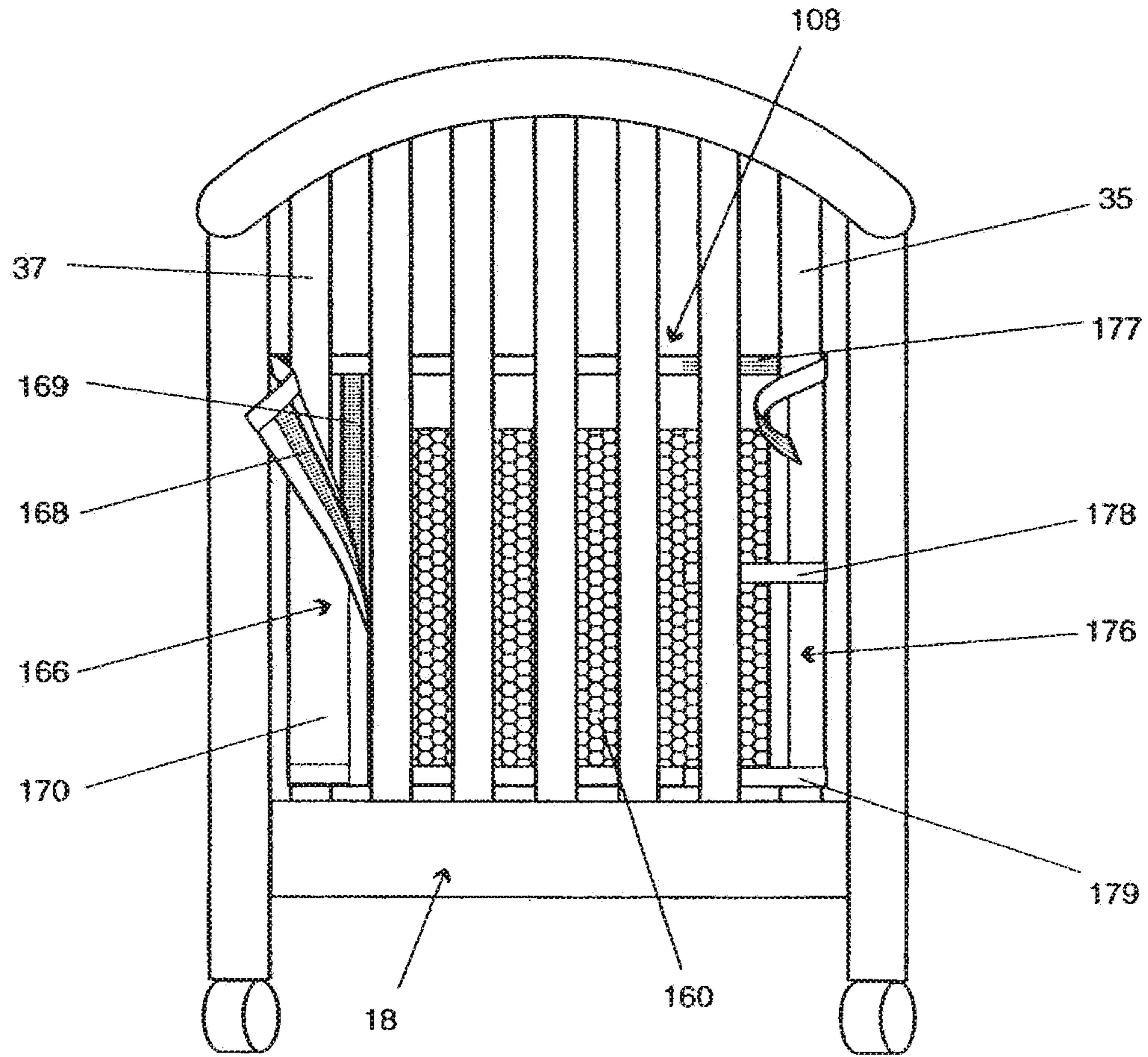


FIG. 8

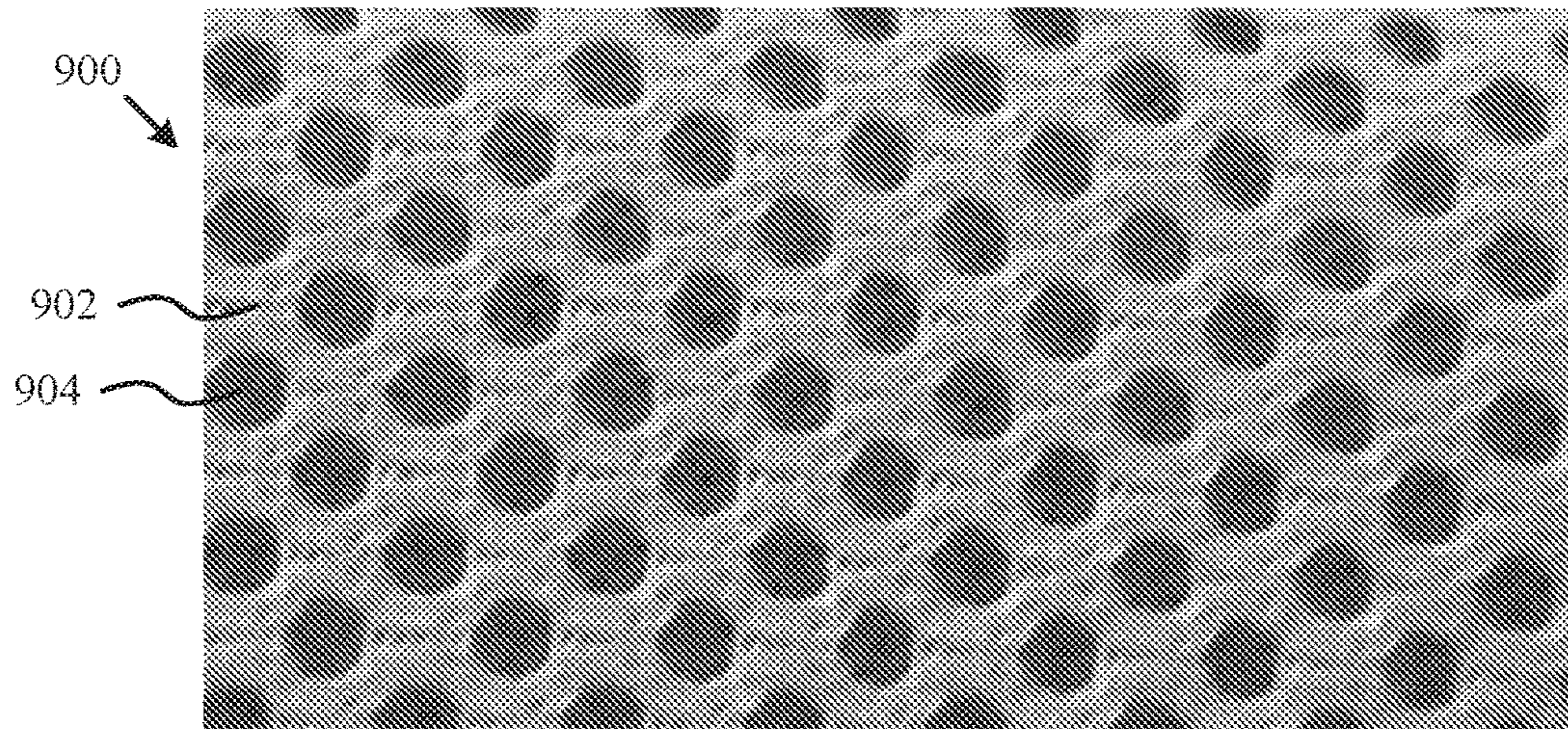


FIG. 9A

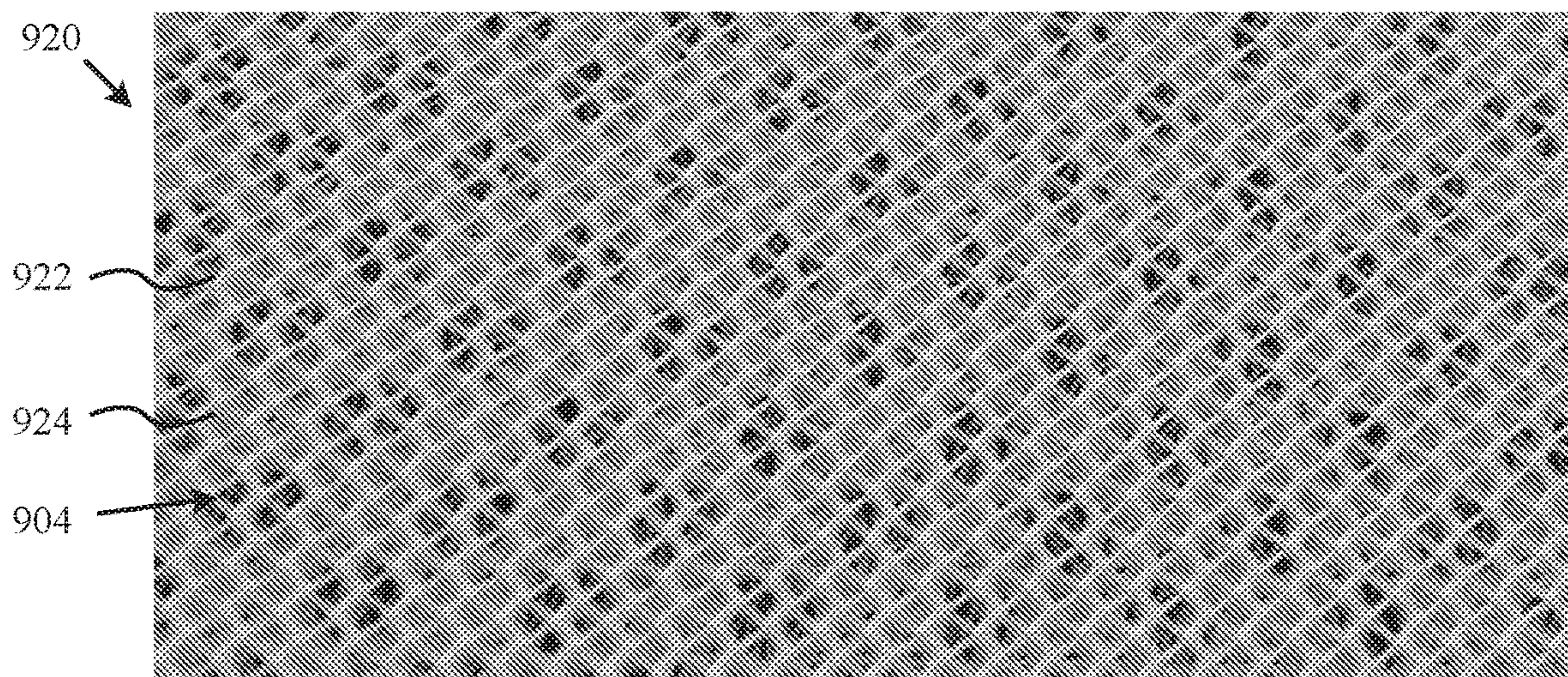


FIG. 9B

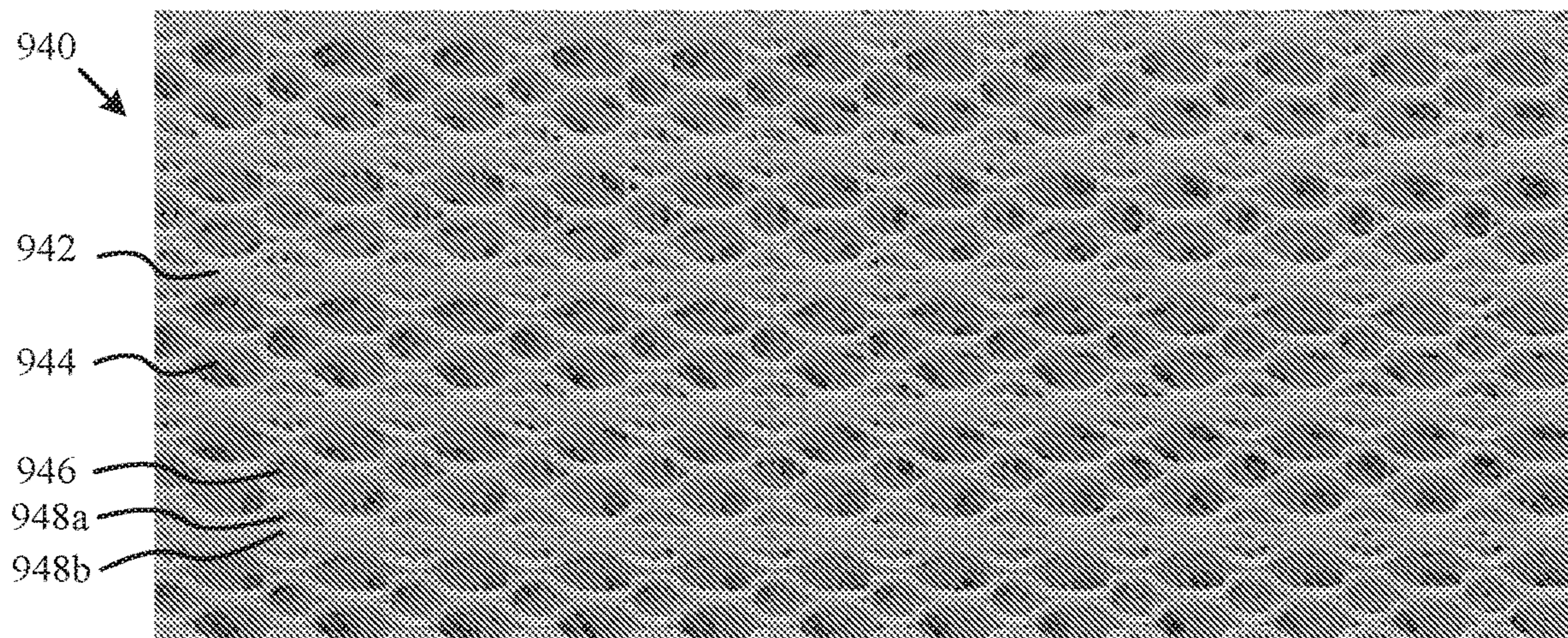


FIG. 9C

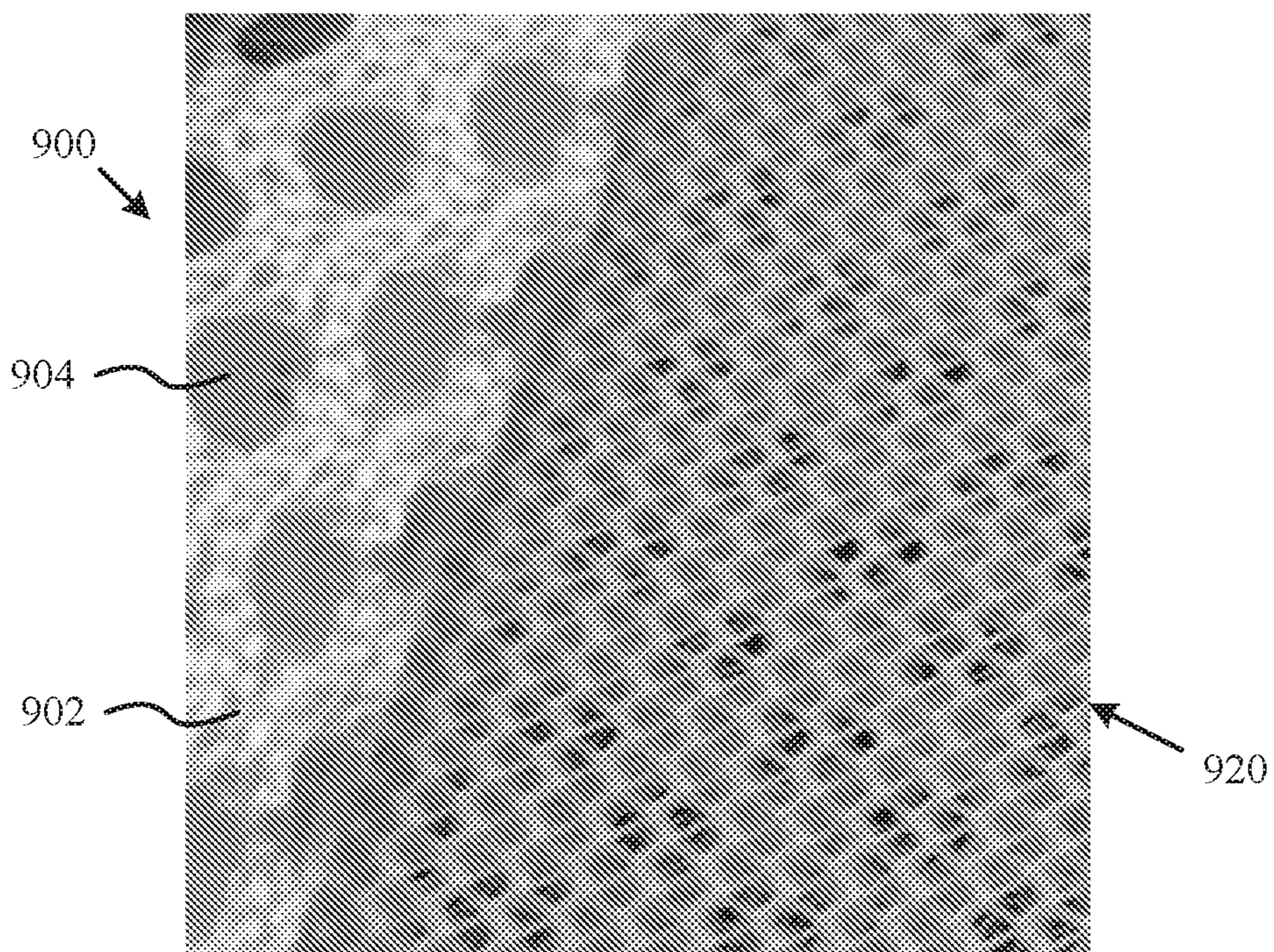


FIG. 10

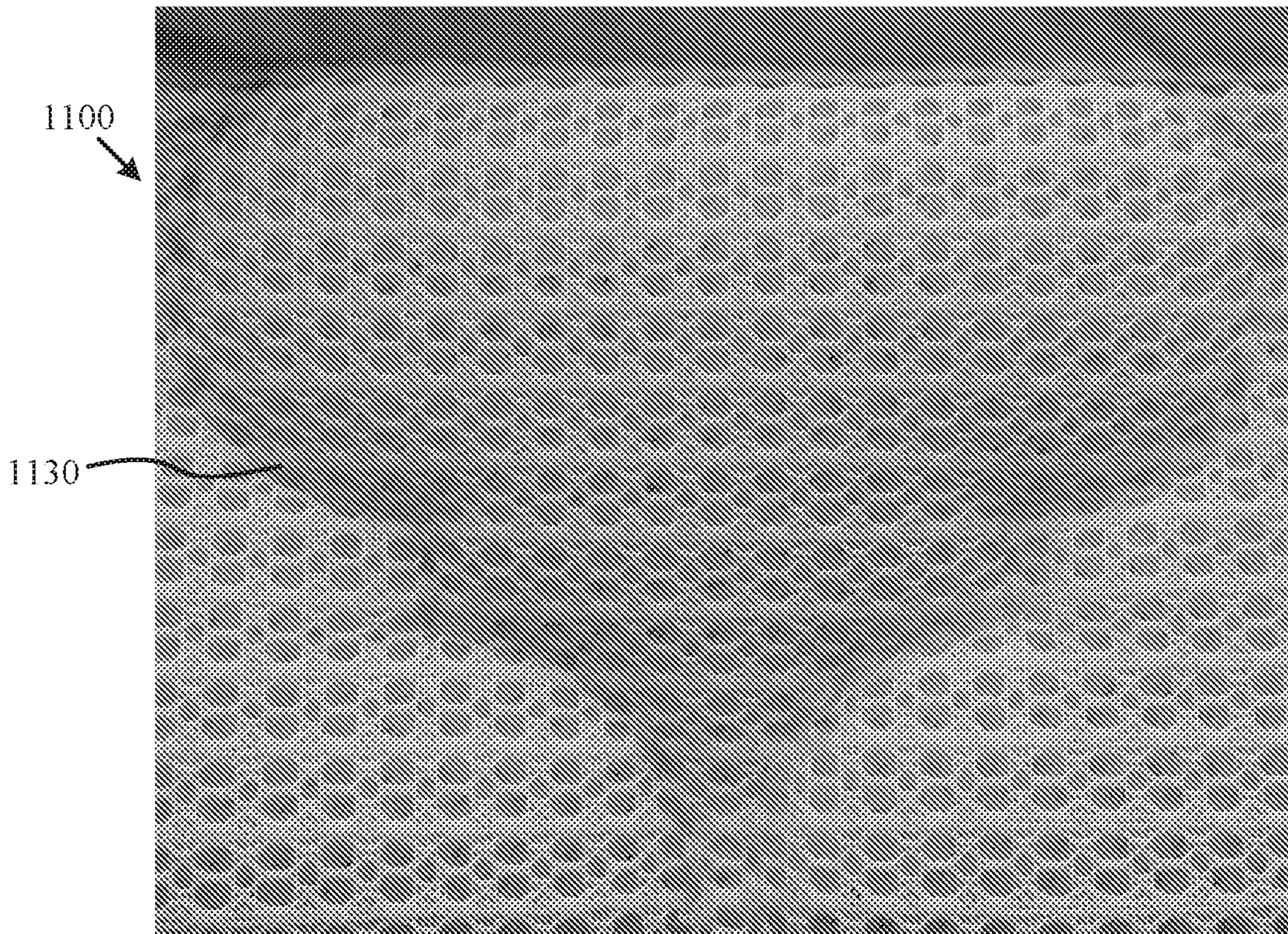


FIG. 11A

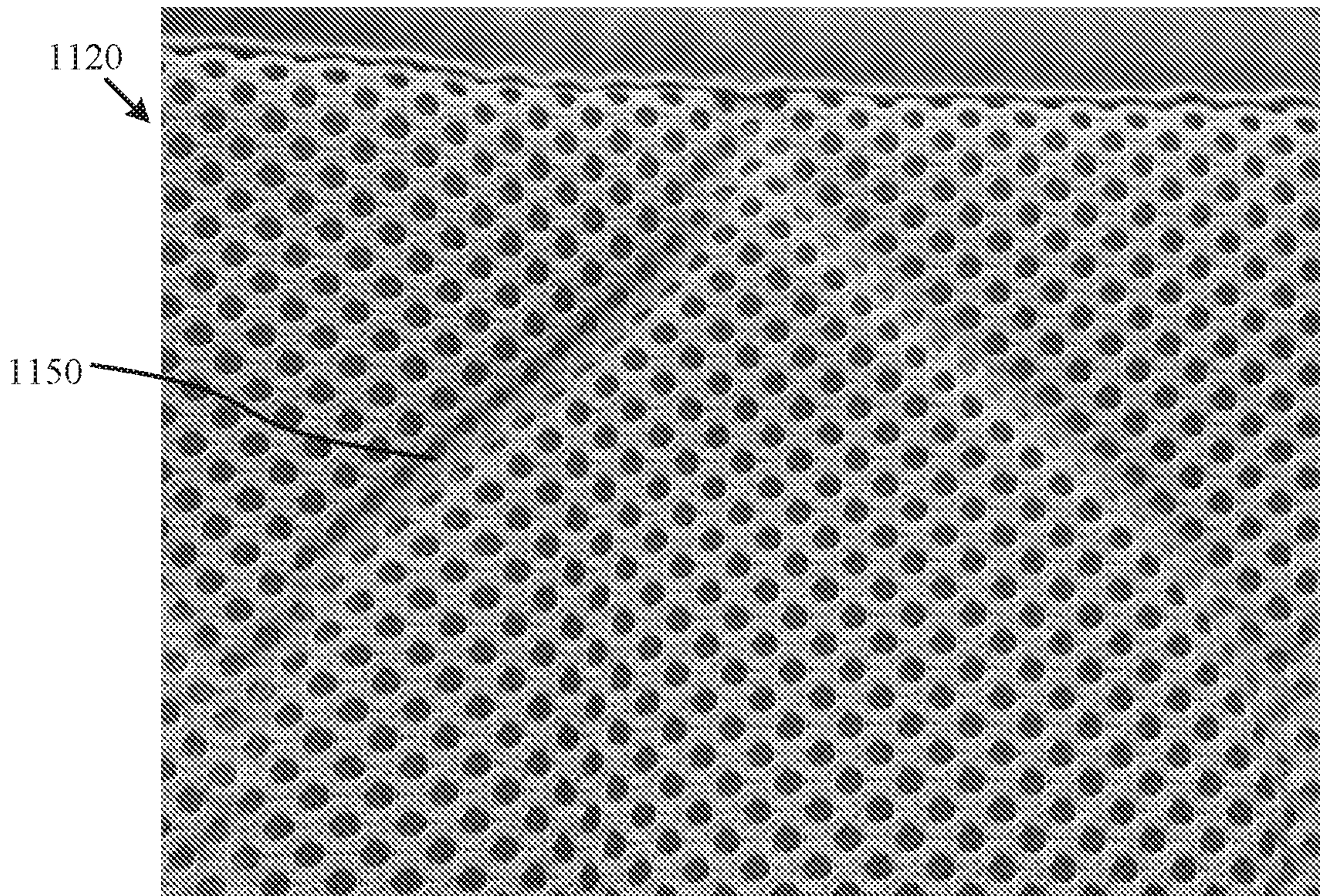


FIG. 11B

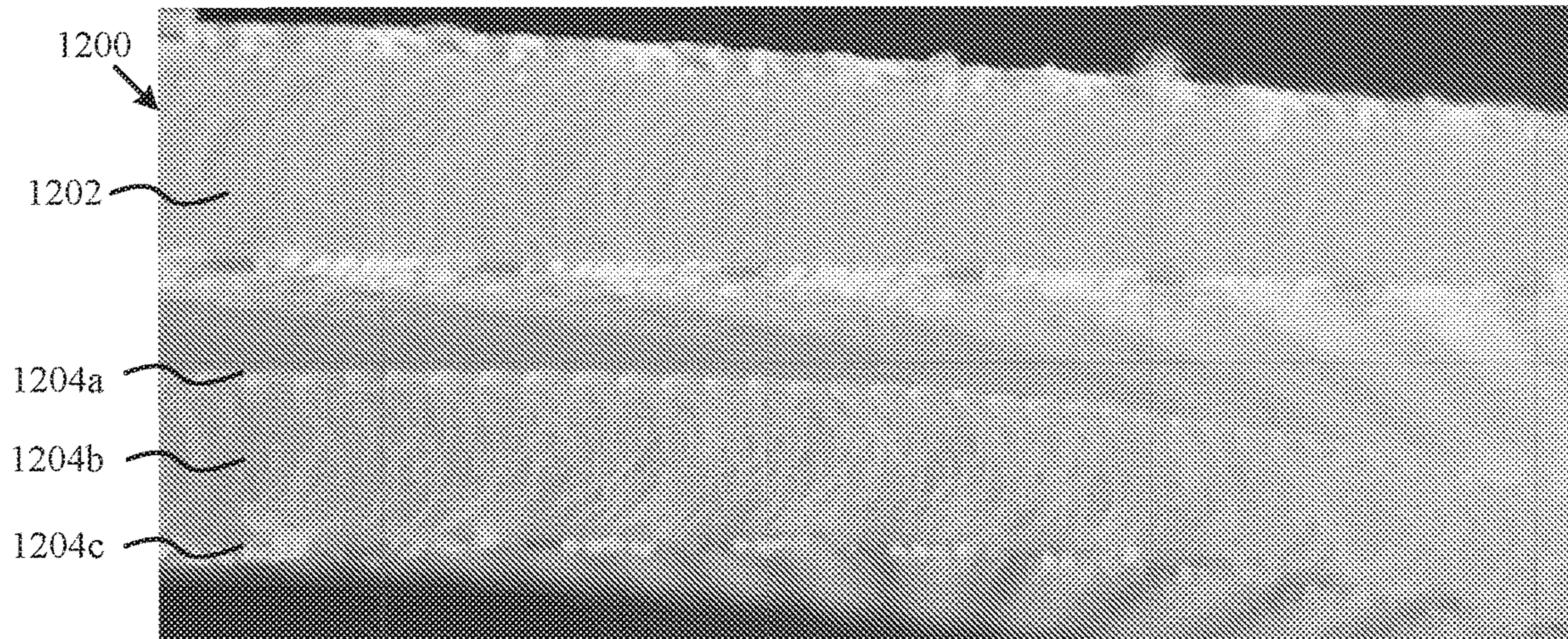


FIG. 12A

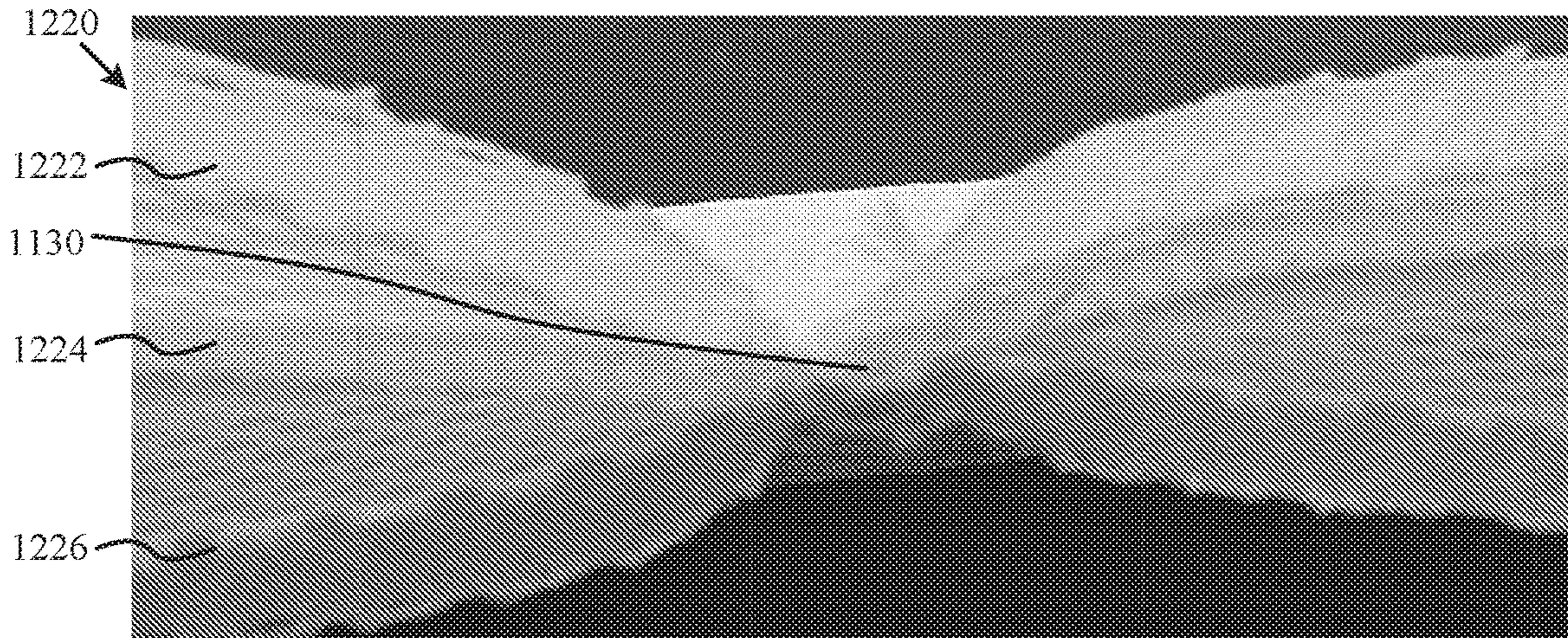


FIG. 12B

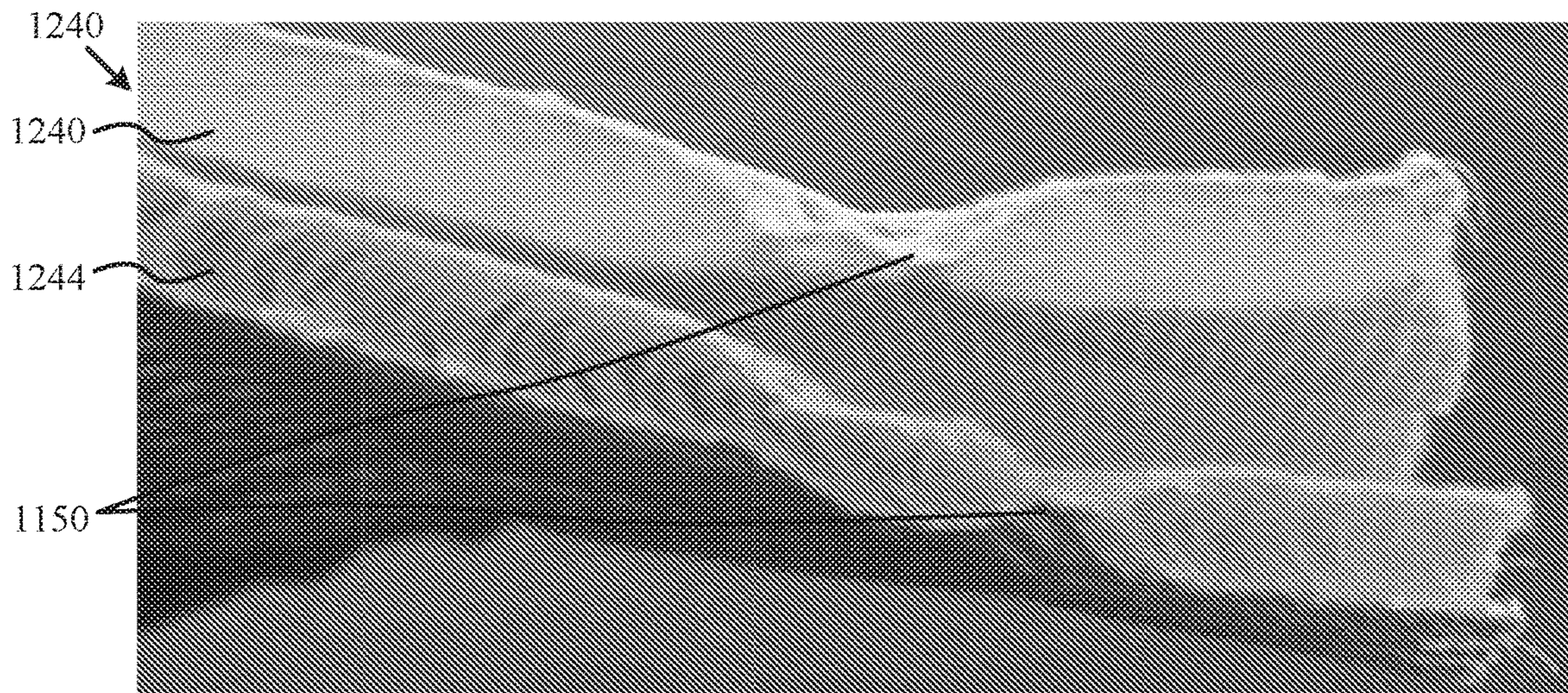
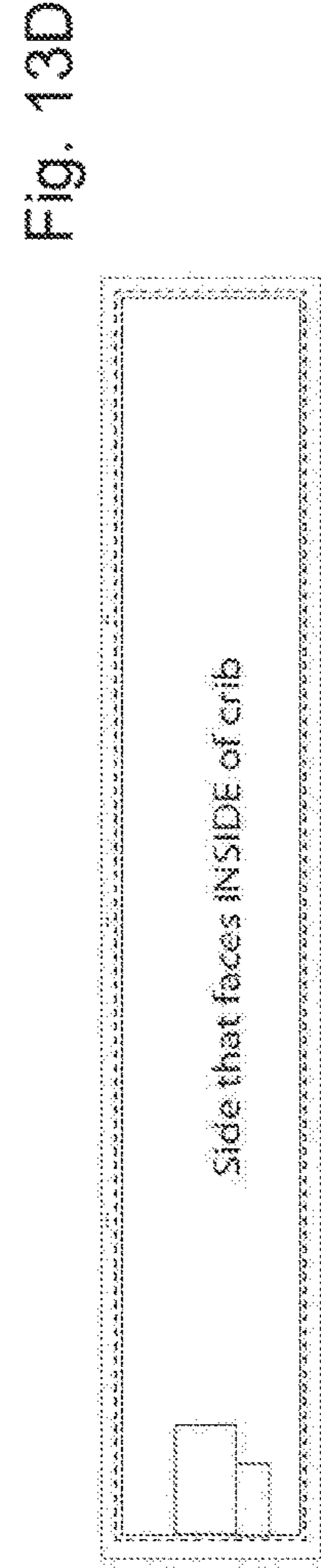
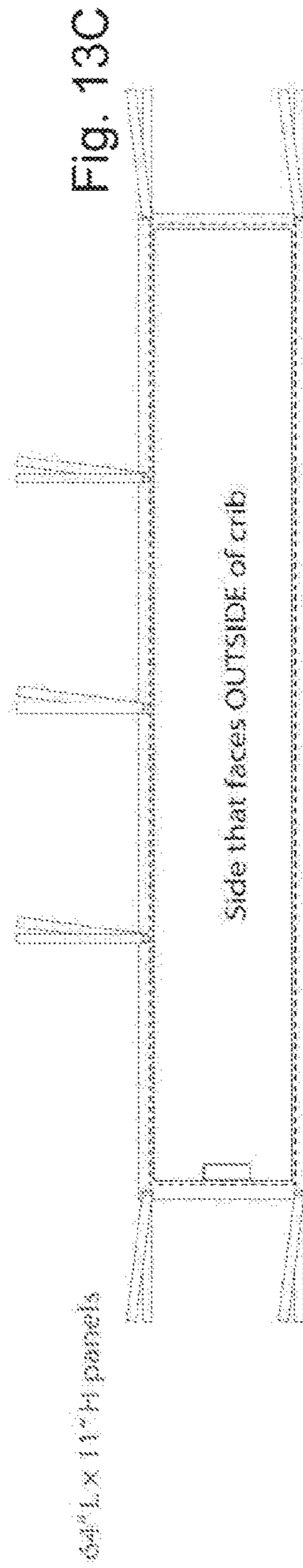
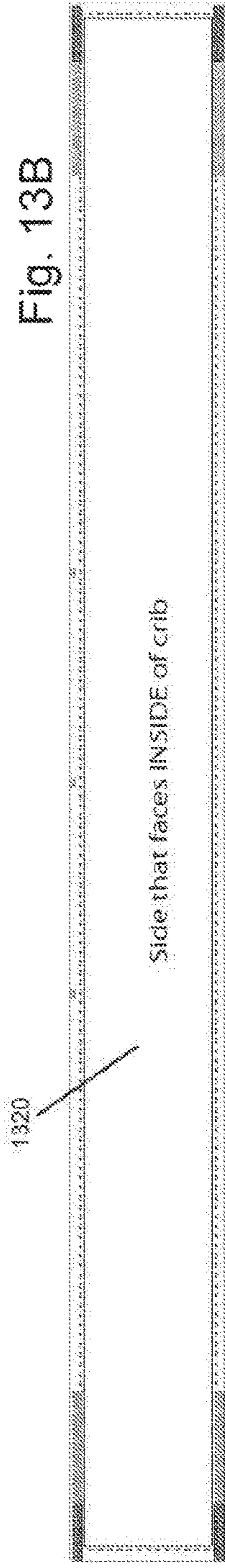
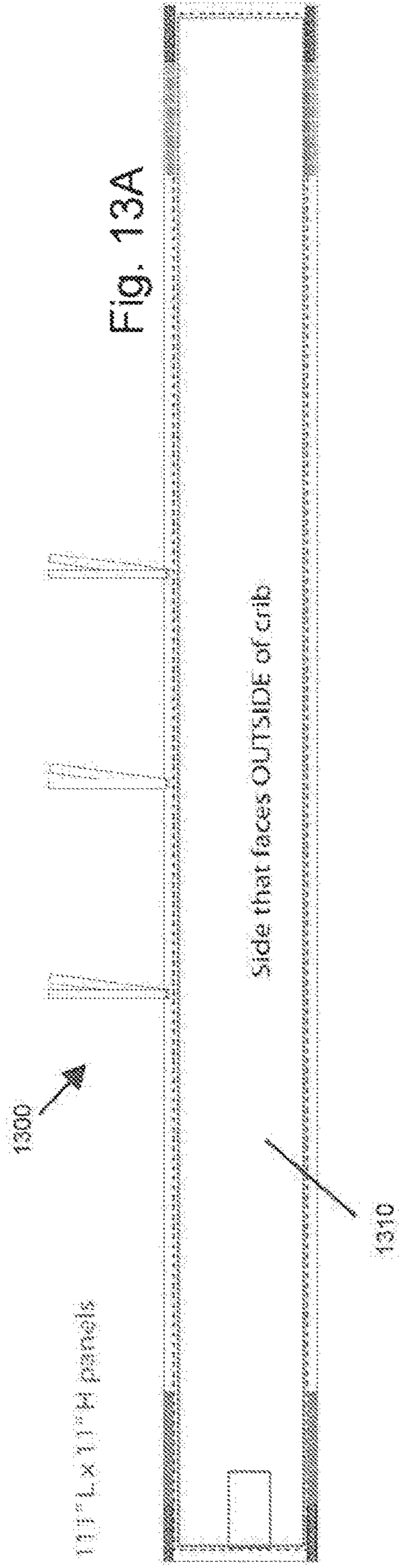


FIG. 12C

2-pc Reversible Liner





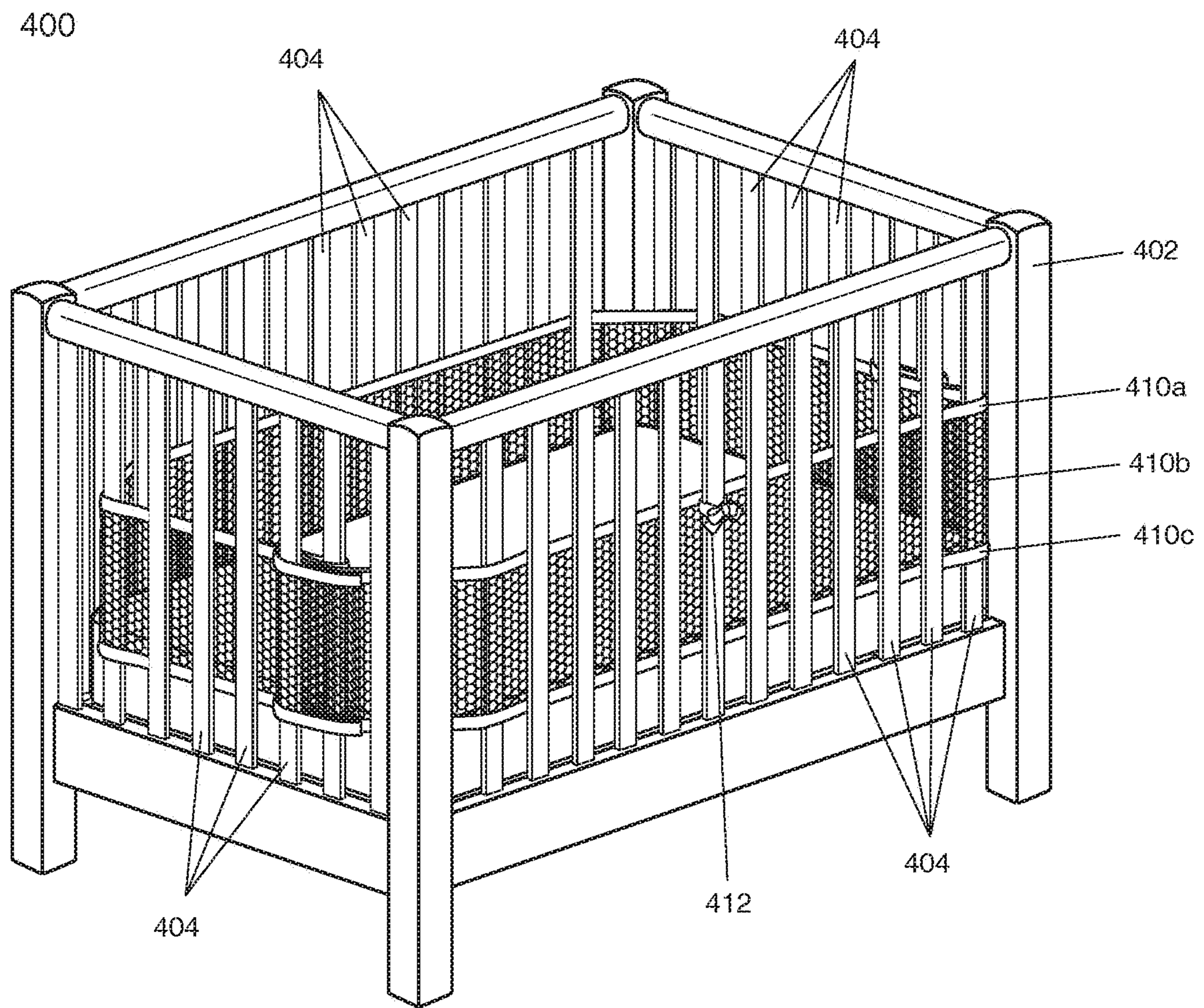


FIG. 14

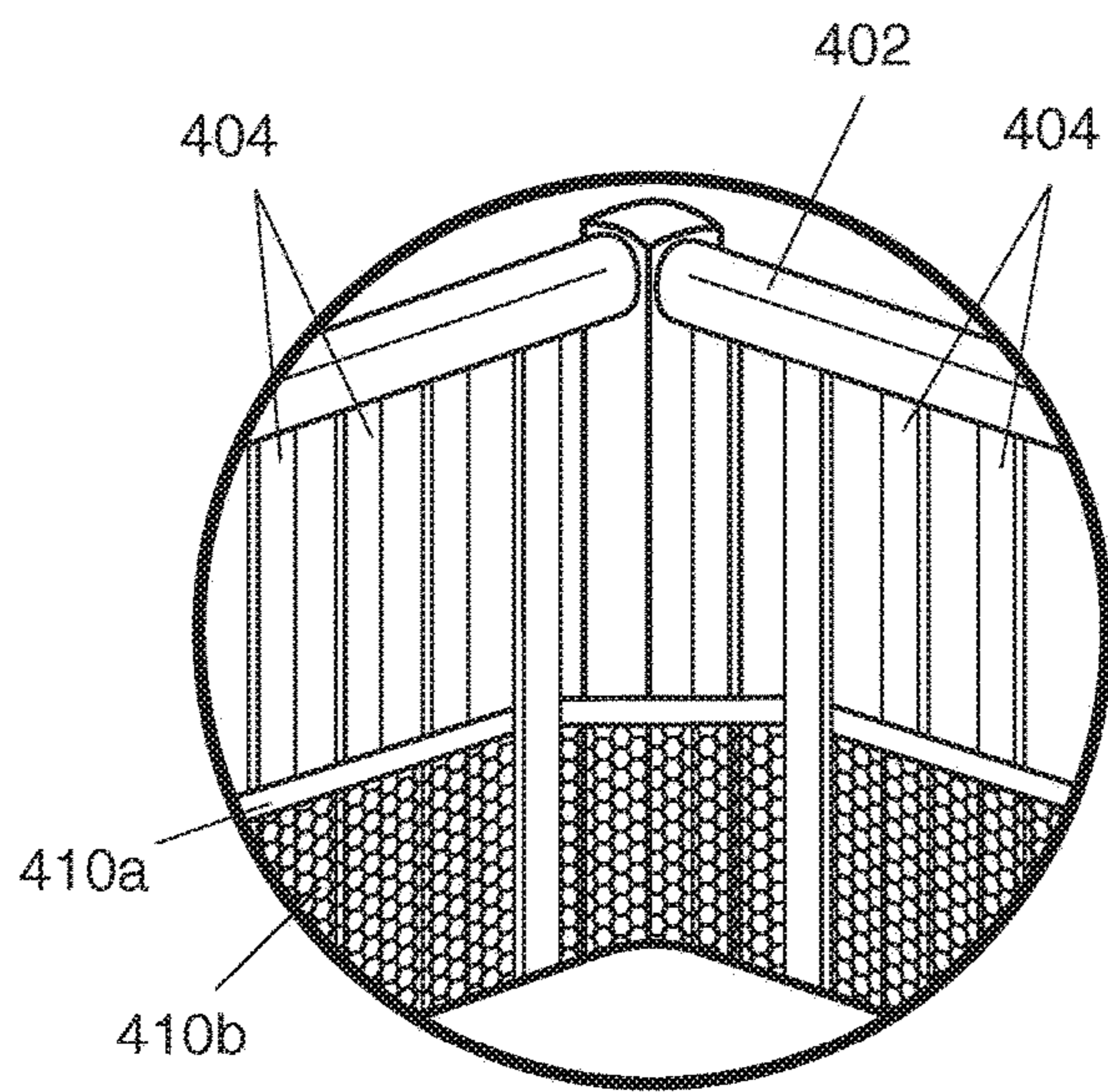


FIG. 15A

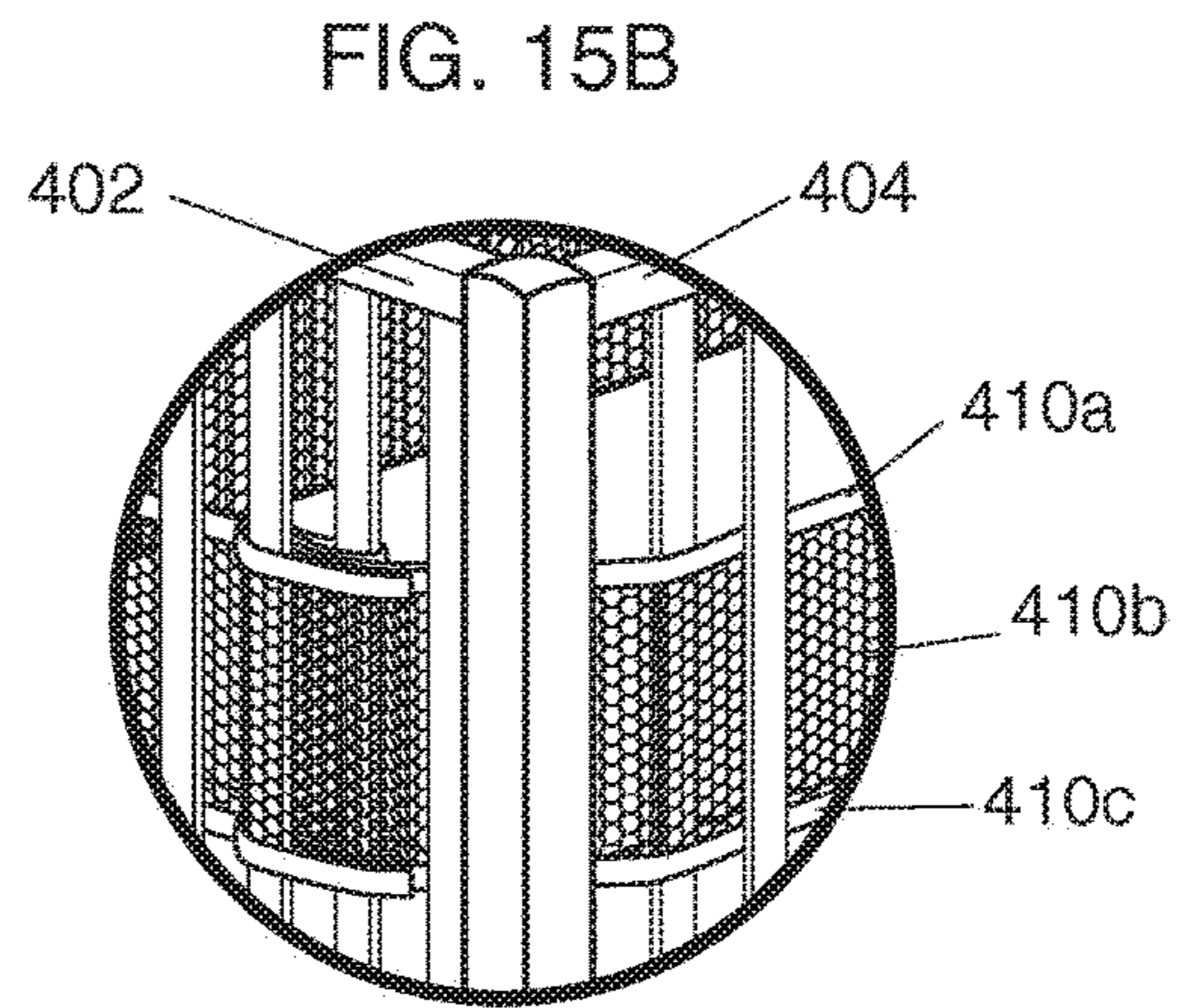


FIG. 15B

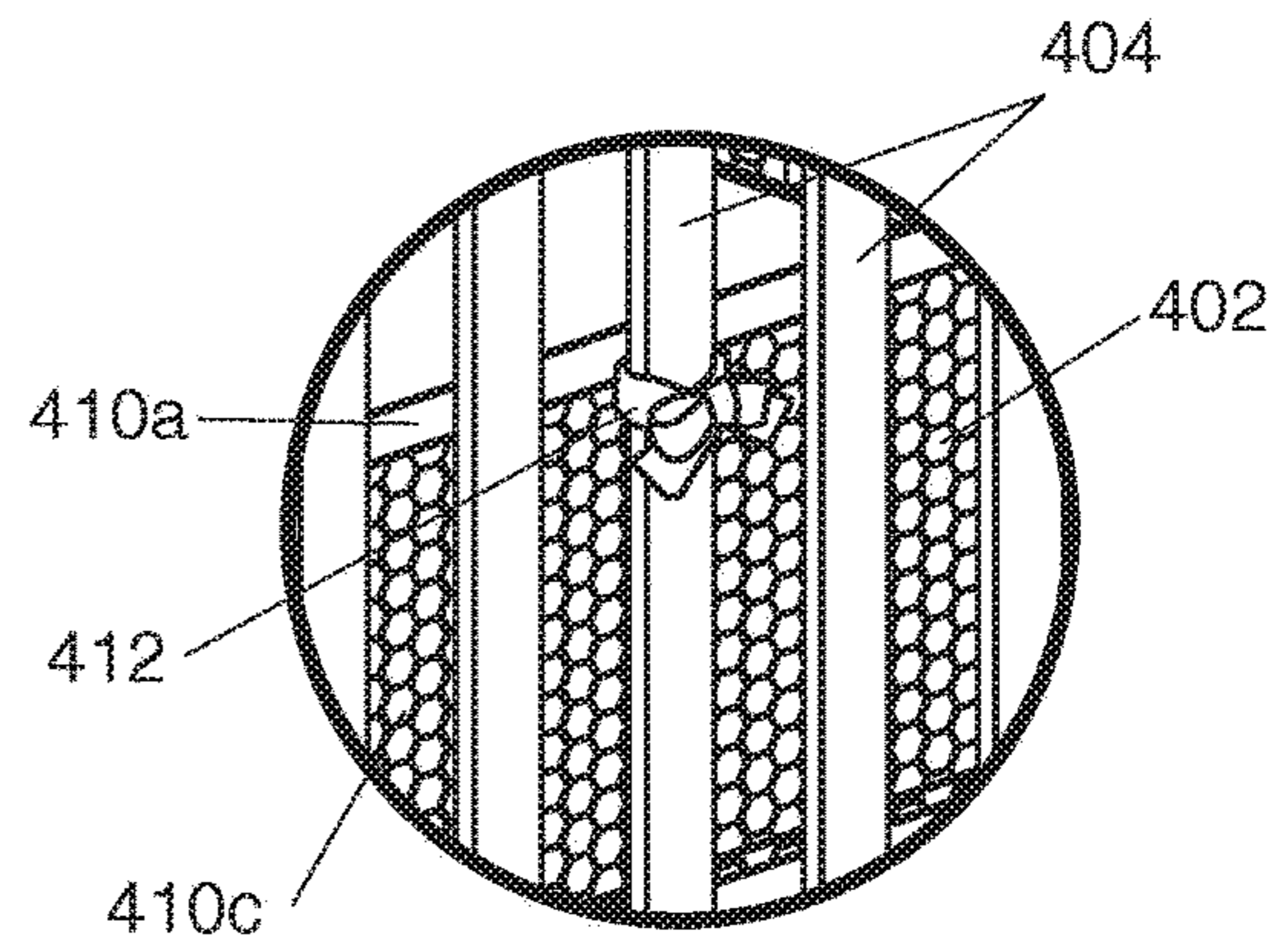


FIG. 15C

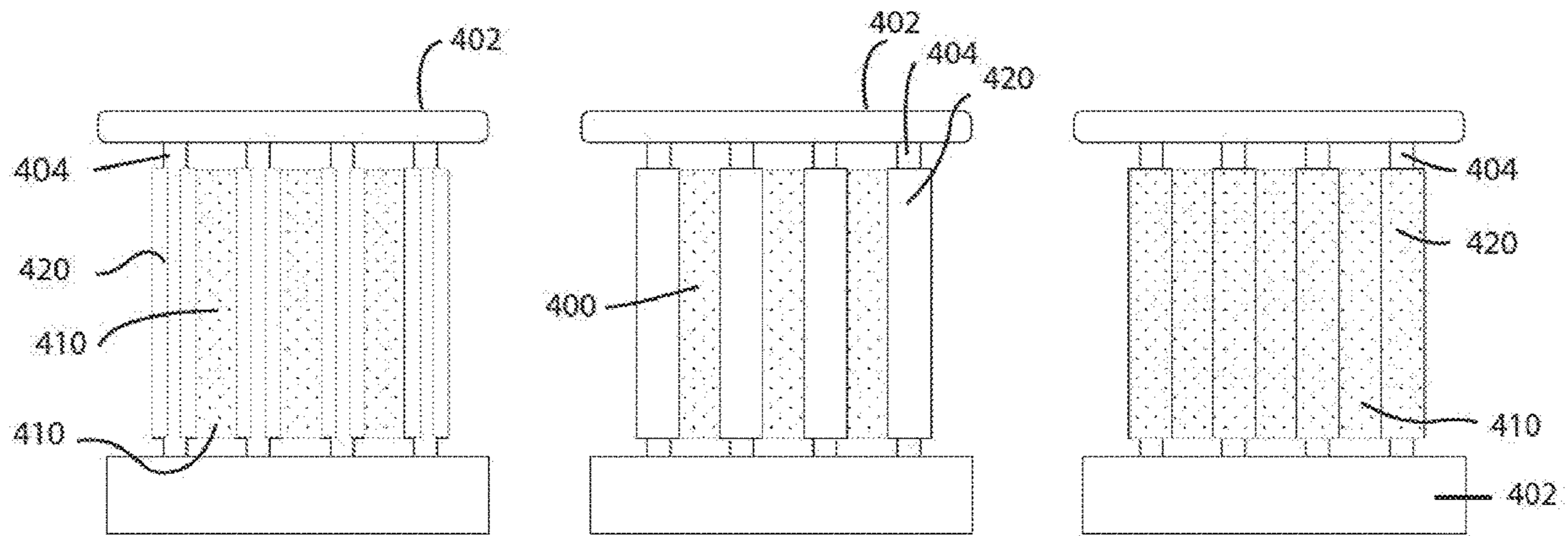


FIG. 16A

FIG. 16B

FIG. 16C

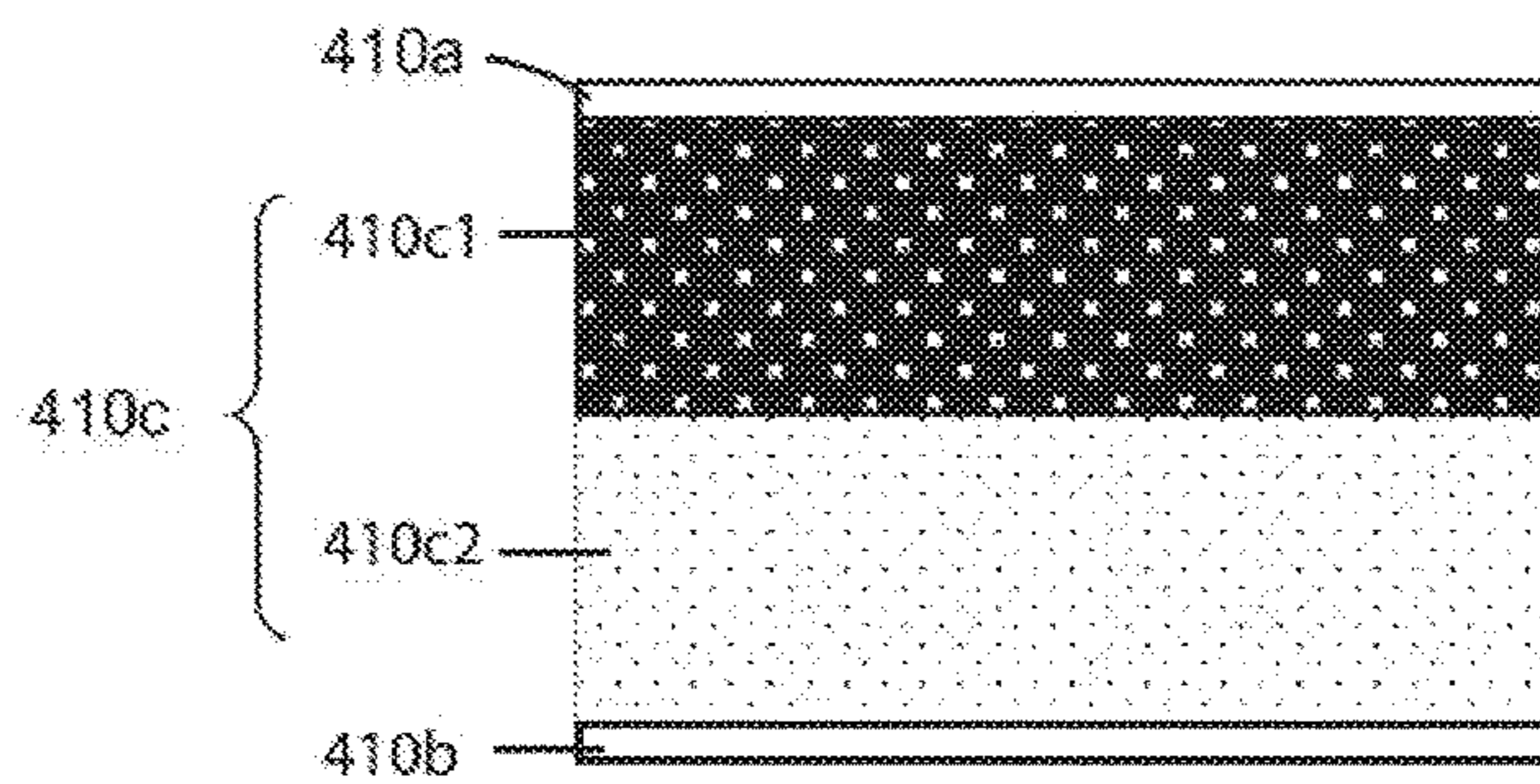


FIG. 17

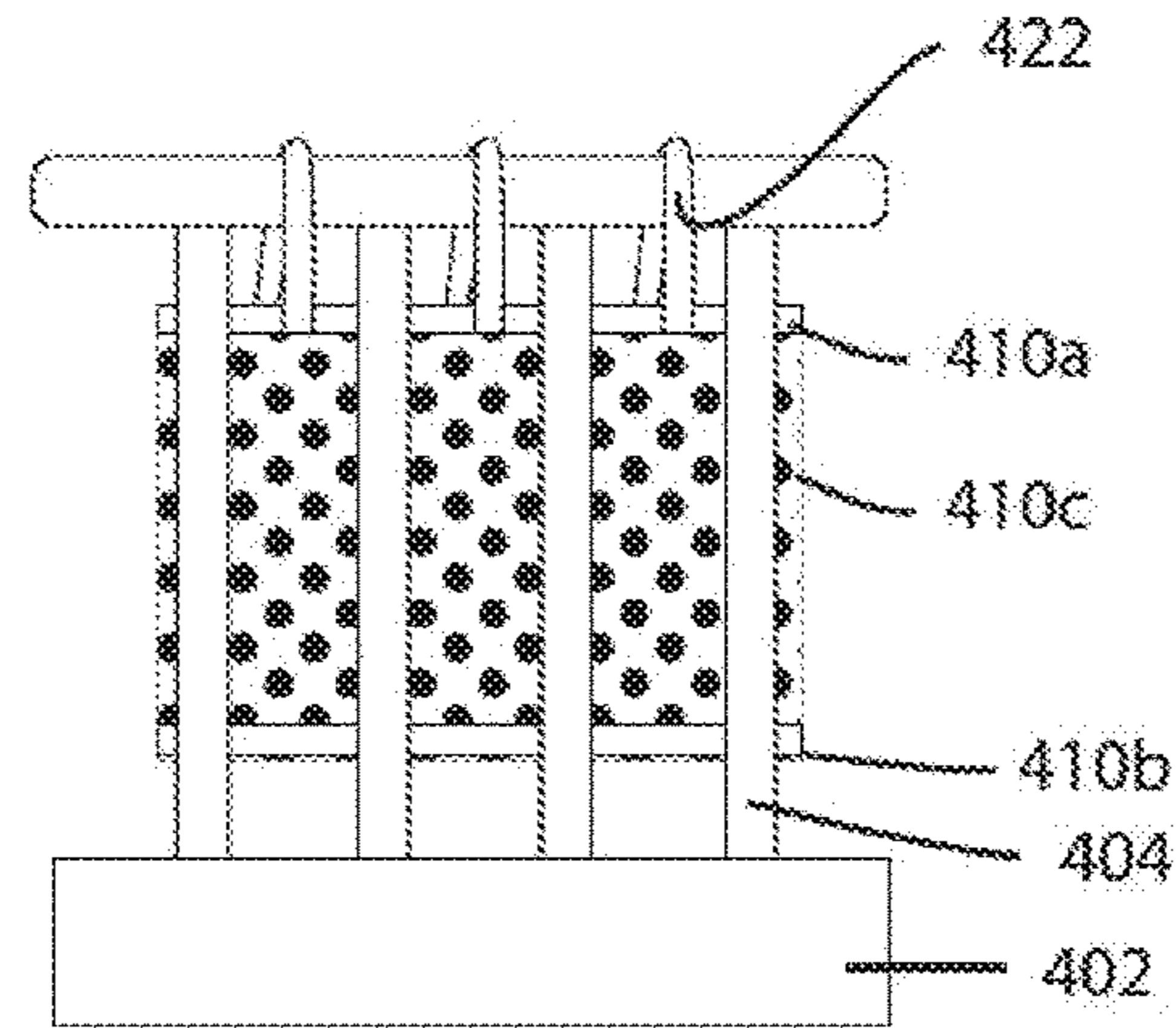


FIG. 18

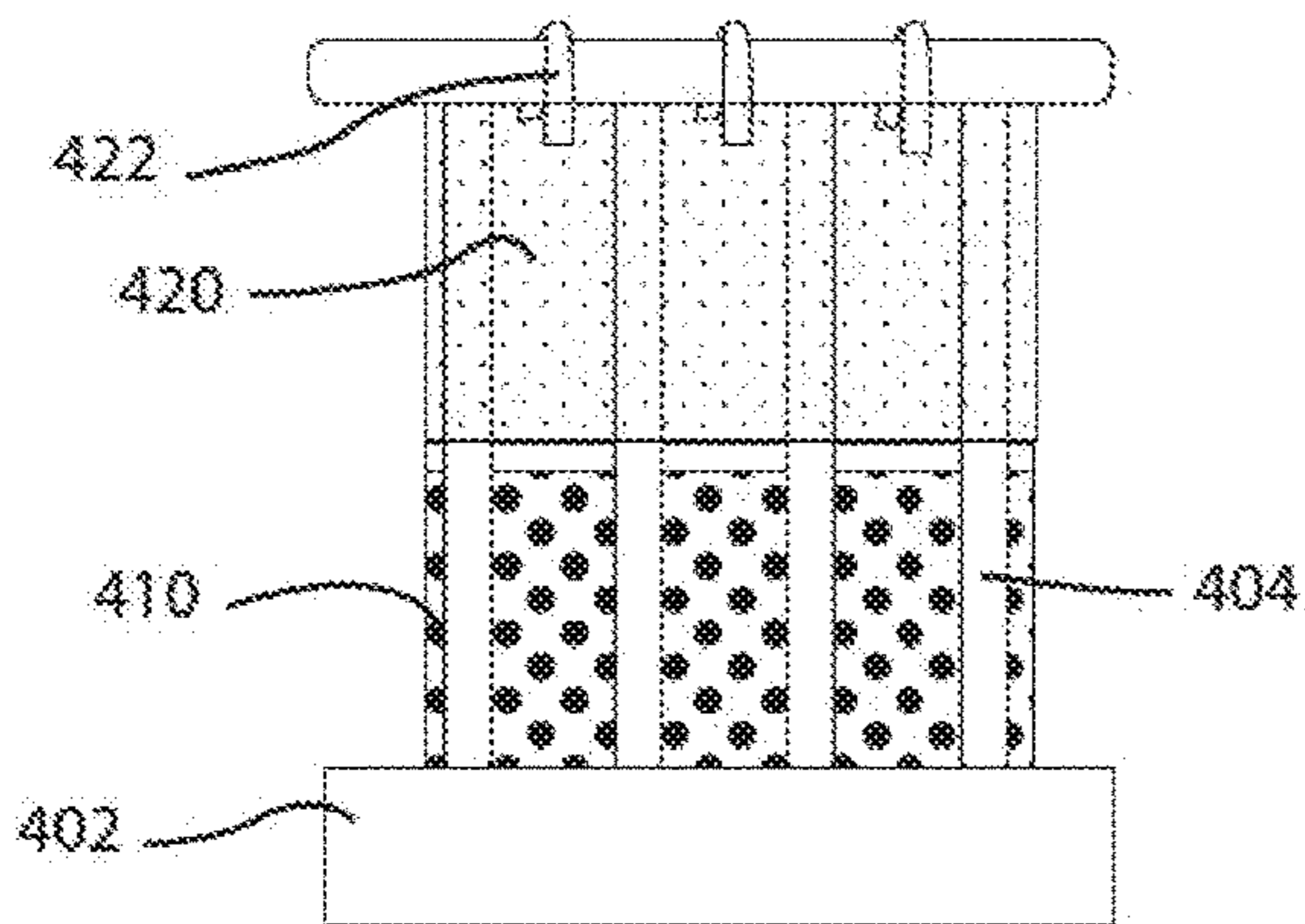


FIG. 19A

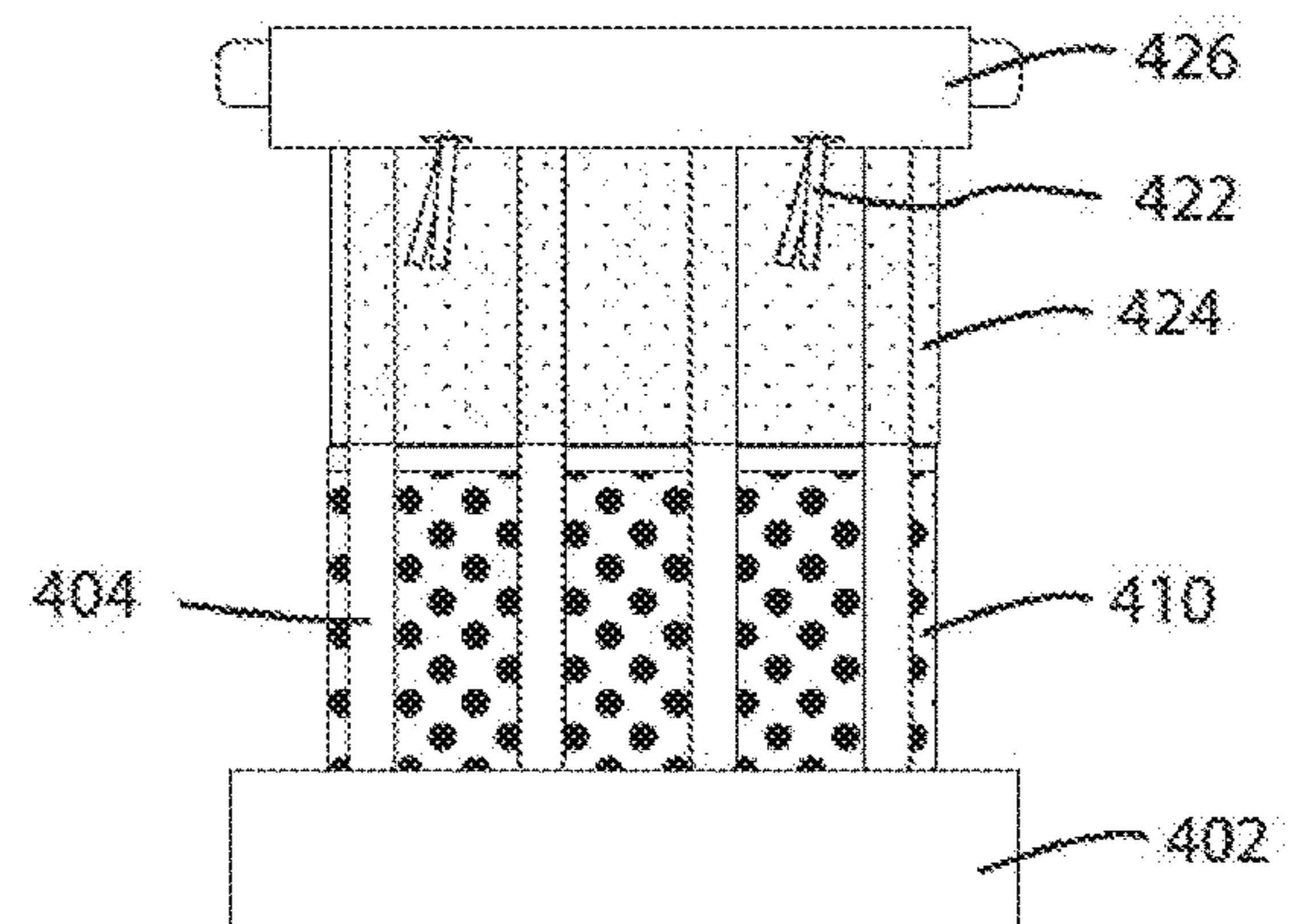


FIG. 19B

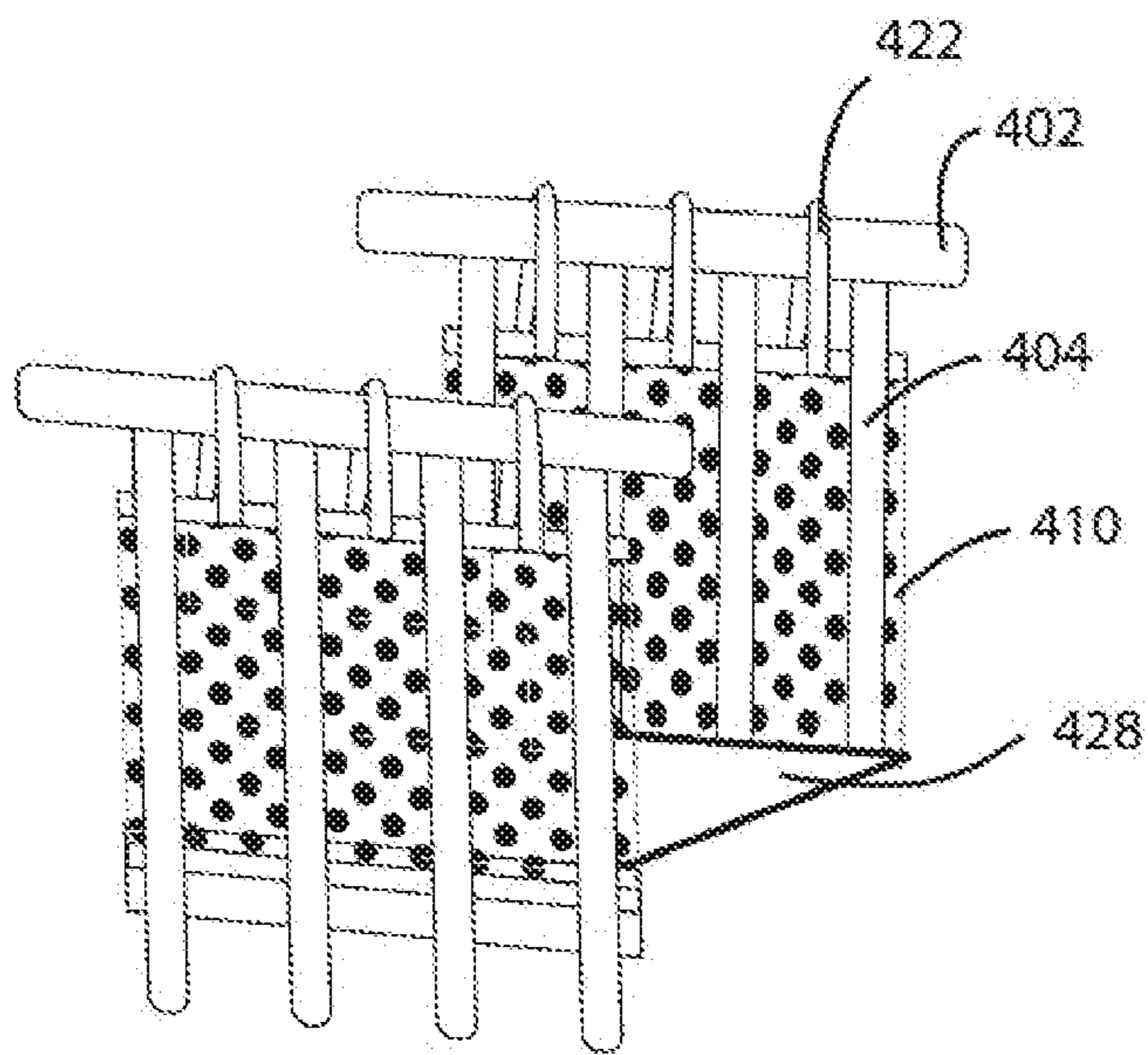


FIG. 20A

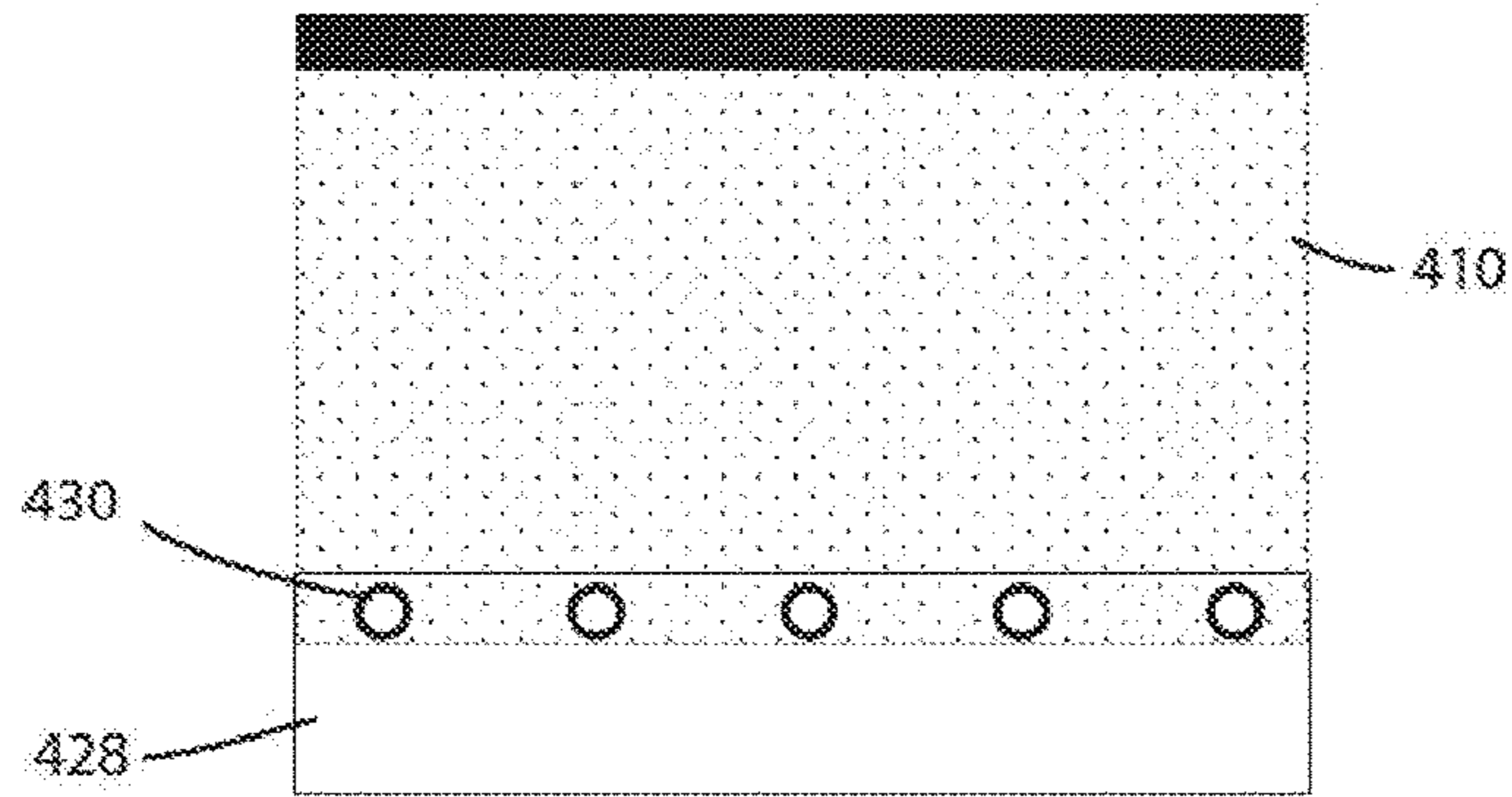


FIG. 20B

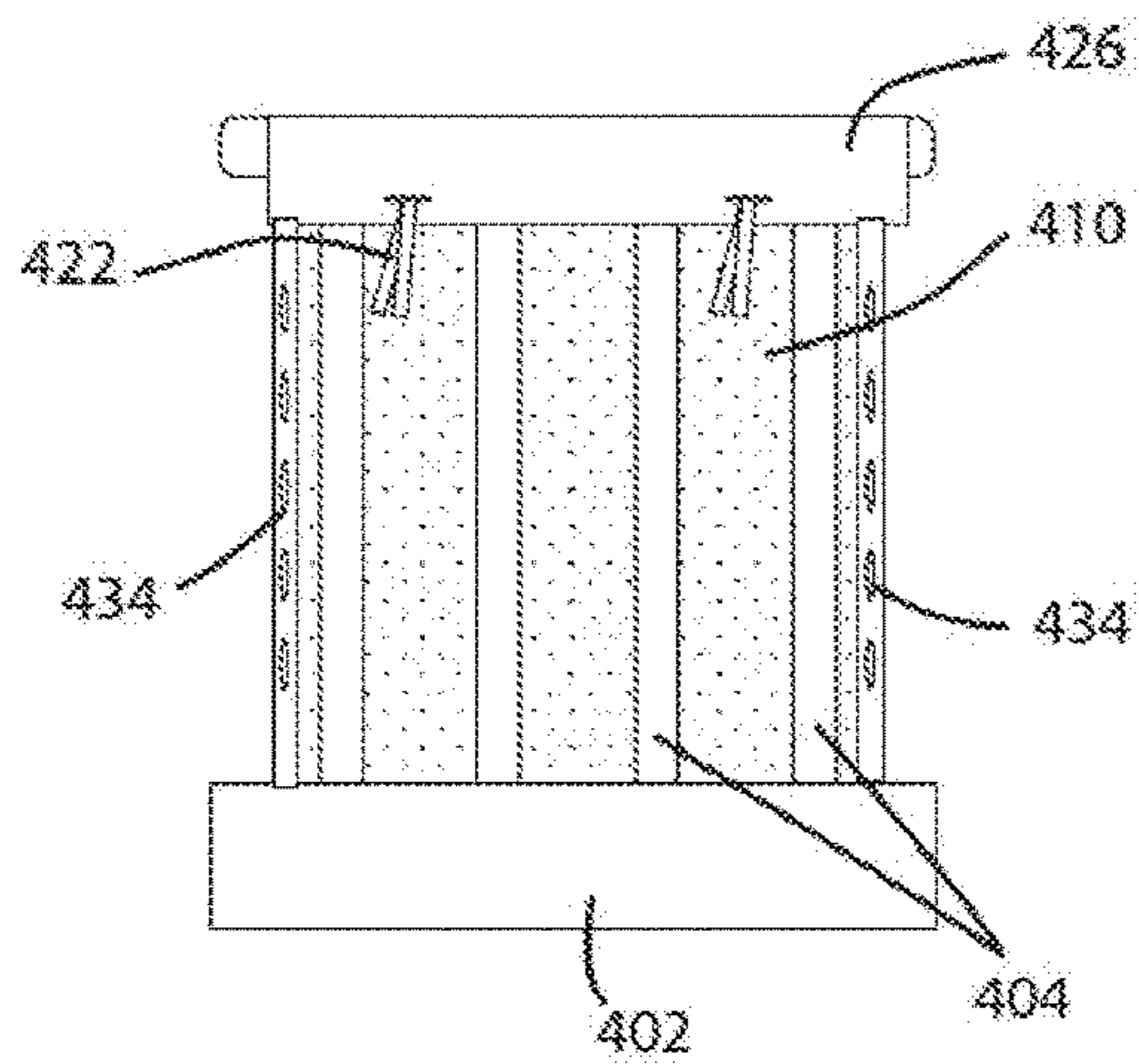


FIG. 21A

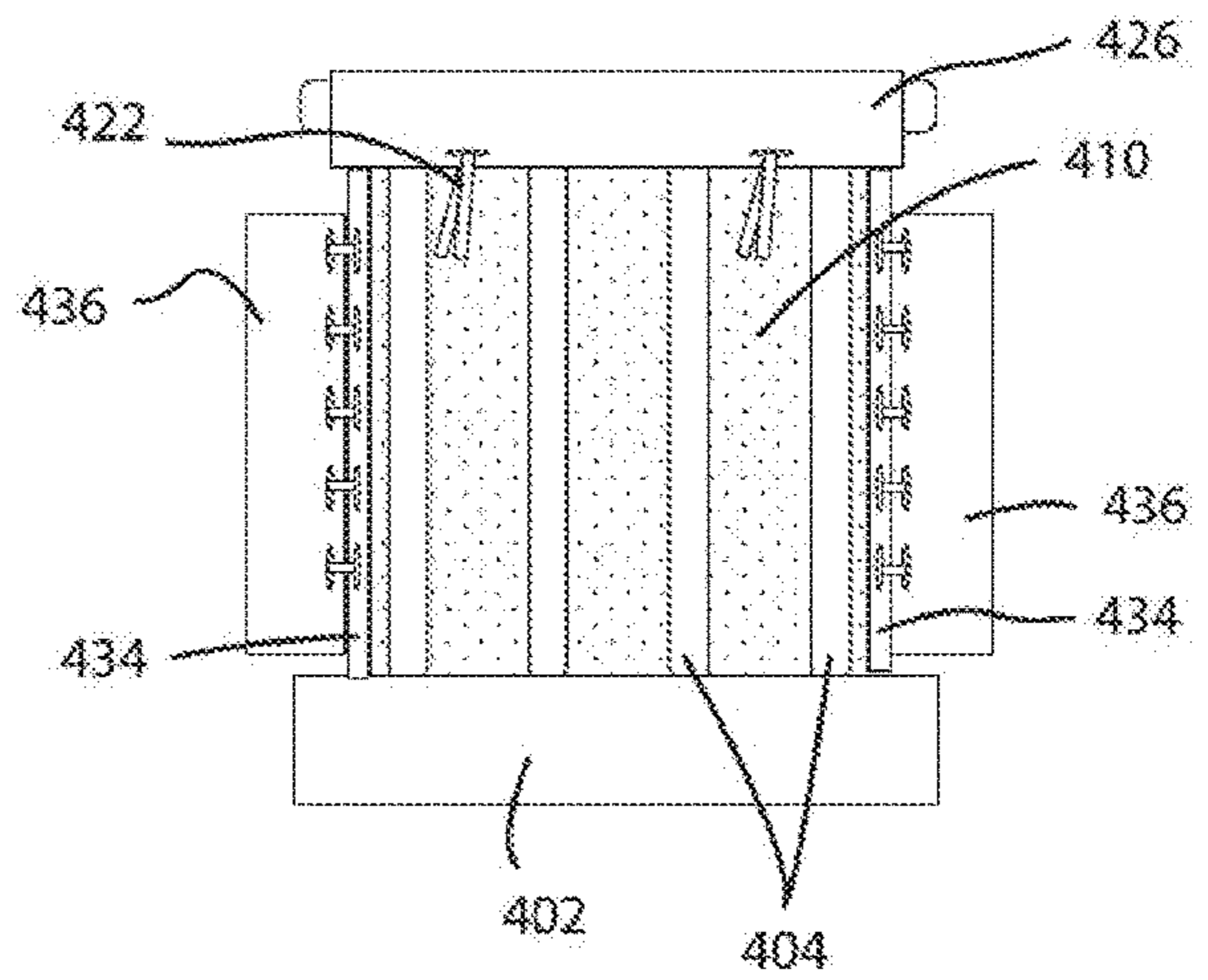


FIG. 21B

**DURABLE CRIB SHIELD SYSTEM**

## BACKGROUND OF THE INVENTION

The present invention relates to cribs and other usable objects (e.g., child usable objects). More particularly, the present invention pertains to crib attachments and other breathable apparatus that, for example, protect infants or young children from harm, e.g., crib attachments that prevent or protect infants or young children when in a crib from getting into one or more problematic situations, e.g., getting limbs extended and caught between crib slats or chewing on crib rails, siblings poking sharp objects into the crib, etc.

For example, conventional baby cribs include side rails that are made up of top and bottom horizontal bars interconnected by a series of spaced supports (e.g., vertical slats). Frequently, babies and toddlers, while sleeping or playing in their cribs, intentionally or accidentally extend their limbs out of the crib between the slats and have difficulty drawing them back into the crib. If this occurs when the child is sleeping, the extended limbs will remain uncovered and become cold, and the child will be ultimately awakened or harmed. Many cribs also have headboards and footboards (i.e., endboards) that are also made with spaced-apart supports and the baby may also extend its arms or legs out of the crib between these slats.

Although various types of apparatus have been used to prevent such problematic situations (e.g., extension of limbs outside of the crib through the spaced-apart supports), many of such apparatus exhibit their own problems. For example, as described herein, ventilation may be problematic (e.g., such as that leading up to and resulting in suffocation). For example, crib bumpers are widely used in cribs for protecting a child from injury caused by bodily impact of the child against the sides of the crib that define the interior boundary of the crib. However, in many cases, such bumpers do not allow for adequate ventilation within the crib and obstruct view of the child.

Infants usually breathe through the nasal passages. However, during crying or in the event their nasal passages are blocked, infants may breathe through their oral cavities. Mechanical resistance suffocation takes places when respiration is interrupted if these passages are both blocked externally by an object. When respiration is interrupted, CO<sub>2</sub> levels in the blood rise. The body's response to this elevation in CO<sub>2</sub> levels is to attempt more rigorous respiration. If the agent of suffocation is not removed, the incident may be fatal after two or three minutes. Further, the accumulation of CO<sub>2</sub> or other dangerous gases inside the crib or around the infant may be a possible cause of sudden infant death syndrome (SIDS). Existing crib apparatus, such as crib bumpers, tend to trap dangerous gases inside the crib. Further, such apparatus may block the passages of infants under certain circumstances.

Various types of other crib apparatus have been described and attempt to reduce one or more of the above problems. For example, such apparatus are described in U.S. Pat. No. 5,881,408 to Bashista et al., entitled "Mesh Crib Liner," issued 16 Mar. 1999; and U.S. Pat. No. 6,178,573 to Wagner et al., entitled "Ventilation Upgrade Kit for a Crib Bumper and Method of Using It."

## SUMMARY OF THE INVENTION

The present invention, as described herein, addresses the problems described above and other problems of prior art systems and methods that will become apparent to one

skilled in the art from the description below. For example, in a first aspect, a crib shield system, suitable for use with a crib, may include a mesh body portion; wherein the mesh body portion is comprised of at least a first mesh layer and a second mesh layer; wherein the first mesh layer and the second mesh layer are configured to be approximately the same height and length; wherein the first mesh layer and the second mesh layer are configured to be secured together to form a single panel; and wherein both the first mesh layer and second mesh layer comprise openings too small to permit an infant to insert a finger or toe there through.

In a second aspect, the invention may include a crib shield system, suitable for use with a crib, wherein the crib shield system comprises a mesh body portion, further comprising a first mesh-type material; wherein the mesh body portion comprises approximately 50% or more of a mesh-type material; wherein the first mesh-type material comprises a woven portion with a first size of openings too small to permit an infant to insert a finger or toe there through, and wherein the first mesh-type material comprises a woven portion with a second size of openings too small to permit an infant to insert a finger or toe there through.

In a third aspect, the invention may include a crib shield system, suitable for use with a crib, wherein the crib shield system comprises a mesh body portion, which further comprises a first mesh-type material; wherein the mesh-type material comprises a front layer, a middle layer, and a back layer; wherein the front layer, middle layer, and back layer of the mesh-type material are quilted together along at least two seams crossing the mesh body portion; wherein the at least two seams cross each other to create a pattern in the mesh body portion; and wherein the quilting anchors the middle layer to the front layer and back layer along the at least two seams.

In a fourth aspect, the invention may include a crib shield system, suitable for use with a crib, in which the crib shield system comprises a mesh body portion, further comprising a first mesh-type material; wherein the mesh-type material comprises a front layer, a middle layer, and a back layer, in which the front layer and back layer have different fabric weaves.

This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A shows a perspective view of one embodiment of a crib shield system attached to a crib, according to one example embodiment of the present invention.

FIG. 1B shows a perspective view of one embodiment of a single-wrap crib shield system attached to a crib, according to one example embodiment of the present invention.

FIG. 1C shows a perspective view of one embodiment of a double-wrap crib shield system attached to a crib, according to one example embodiment of the present invention.

FIG. 1D shows a side view of one embodiment of a hook and loop velcro attachment, according to one example embodiment of the present invention.

FIG. 1E shows a side view of one embodiment of tie attachments, according to one example embodiment of the present invention.

FIG. 1F shows a side view of one embodiment of snap attachments, according to one example embodiment of the present invention.

FIG. 2A is a top view of one embodiment of a first side panel of the crib shield system shown in FIG. 1 in an unattached position laid flat, according to one example embodiment of the present invention.

FIG. 2B is a top view of one embodiment of a second side panel of the crib shield system shown in FIG. 1 in an unattached position laid flat, according to one example embodiment of the present invention.

FIGS. 2C-2F show details of one embodiment of a breathable mesh material that may be used in forming the side panels and the crib shield system shown in FIGS. 1 and 2, as well as other apparatus or objects described in other figures, according to one example embodiment of the present invention.

FIGS. 2G-H show illustrations of printed mesh designs for crib liners, according to one example embodiment of the present invention.

FIGS. 3A-3C illustrate the attachment of the first and second side panels shown in FIGS. 1 and 2 to a crib, according to one example embodiment of the present invention.

FIG. 4A shows a perspective view of a full crib shield system attached to a crib with the mattress of the crib in a lowered position, according to one example embodiment of the present invention.

FIG. 4B shows a perspective view of a full crib shield system attached to a crib, according to another example embodiment of the present invention.

FIG. 5A shows a top view of a side panel for use in the full crib shield system shown in FIG. 4A in an unattached position laid flat, according to one example embodiment of the present invention.

FIG. 5B shows a back side of a crib shield mesh, according to one example embodiment of the present invention.

FIG. 5C shows a front side and several magnified views of a side panel for use in a crib shield system, according to one example embodiment of the present invention.

FIG. 5D shows a side view of a second crib rail cover, according to one example embodiment of the present invention.

FIG. 5E is an illustration of a rail cover having multiple layers of fabric, according to one example embodiment of the present invention.

FIGS. 6A-6F show various illustrations for use in describing the attachment of the side panel shown in FIG. 5 to a crib side rail according to one example embodiment of the present invention.

FIG. 7A shows a top view of an end panel for use in the full crib shield system shown in FIG. 4A in an unattached position laid flat, according to one example embodiment of the present invention.

FIG. 7B shows a back side of a back panel wrap for attaching to a rail cover, according to one example embodiment of the present invention.

FIG. 7C shows a front side of a back panel wrap for attaching to a rail cover, according to one example embodiment of the present invention.

FIG. 8 shows an illustration for attachment of the end panel shown generally in FIG. 7A to a headboard or footboard of a crib, according to one example embodiment of the present invention.

FIGS. 9A-9C show illustrations of an exemplary breathable material, according to one example embodiment of the present invention.

FIG. 10 shows an illustration of two exemplary breathable material layers, according to one example embodiment of the present invention.

FIGS. 11A-11B show illustrations of two exemplary compartmentalized portions of a breathable material, according to one example embodiment of the present invention.

FIGS. 12A-12C show illustrations of exemplary breathable material combinations composed of more than one layer of breathable material, according to one example embodiment of the present invention.

FIGS. 13A-D show illustrations of an exemplary crib liner, which may be reversible, according to one example embodiment of the present invention.

FIG. 14 shows an illustration of one embodiment of a crib liner, according to one example embodiment of the present invention.

FIGS. 15A-C show a detailed illustration of a crib liner, according to one example embodiment of the present invention.

FIGS. 16A-C shows an illustration of a crib liner with crib slat pads, according to one example embodiment of the present invention.

FIG. 17 shows an illustration of a two-part liner system, according to one example embodiment of the present invention.

FIG. 18 shows an illustration of a crib liner with attachment devices, according to one example embodiment of the present invention.

FIGS. 19A-B show an illustration of one embodiment of a crib liner with extended length, according to one example embodiment of the present invention.

FIGS. 20A-B show an illustration of a crib liner with an underneath mattress fabric, according to one example embodiment of the present invention.

FIGS. 21A-B show an illustration of one embodiment of an expandable crib liner, according to one example embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE EMBODIMENTS

In general, the present invention is related to a crib liner that is breathable and provides for some protection from limbs getting entangled in crib slats. The crib liner can be made from any breathable material, such as mesh, and can be one or more panels for attachment to a crib. The crib liner may also be breathable primarily in the area of an infant's head and can be less breathable in other areas such as the borders of the liner. Since, in general, crib liners are removed from the crib as the infant gains the ability to sit or stand, the primary area of breathable concern is from the crib mattress surface up 4 or 5 inches in height, where the infant's head lies during sleeping.

Various embodiments of crib shield systems shall be described with reference to FIGS. 1-21 and the below description. Additional embodiments of the various breathable materials used within the crib shield systems shall be described with further reference to FIGS. 2C-2F, 5E, and 9-13. The particular features of the disclosed embodiments should not be limited to just those illustrated configurations. Instead, the various features disclosed within this disclosure may be combined to create exponentially more embodiments not explicitly illustrated within this disclosure. For



example, the various fastener apparatus and configurations for attaching the crib liner to a crib disclosed within may be combined in far more configurations than illustrated within the confines of this disclosure. Further, some exemplary embodiments are illustrated as one panel embodiments while other exemplary embodiments are illustrated as two panel embodiments. It should be understood that the features of such illustrated one panel embodiments and illustrated two panel embodiments (e.g., size, shape, fastener arrangement, method of attaching to crib, etc.) may be interchanged and/or combined to form exponentially more embodiments not explicitly illustrated within this disclosure. As such, the claims should not be limited only to such exemplary illustrated embodiments. Additionally, breathable material includes breathable mesh material and breathable padded mesh material, but may also include alternate material(s) that have similar breathable and/or padding properties (e.g., the weave found in cotton sweaters, such as a corded cotton sweater, may be sufficiently padded and breathable).

FIG. 1A shows a conventional crib 10. The crib 10 can include two side rails 12, 14, and further, a footboard 16, and a headboard 18, referred to generically as endboards. The side rails 12, 14 extend between the footboard 16 and headboard 18 along a length thereof. The headboard 18, footboard 16, and side rails 12, 14 are connected and sized for receiving a mattress within an interior 11 of the crib 10. As illustrated, the crib is configured to receive a standard rectangular-shaped crib mattress.

Generally, the side rails 12, 14, footboard 16, and headboard 18 define an interior boundary extending proximate and around a periphery of the mattress 26 disposed within the crib 10. The mattress 26 is supported within the crib 10 by various structure not shown in FIG. 1A. For example, a bottom structural member may be supported at one or more positions about the interior boundary of the crib 10 (e.g., elements attached to corners 36, 38, 31, 33) or in any other fashion. In many conventional cribs 10, the mattress 26 and/or a supporting member therebelow may be raised and/or lowered. For example, as shown in FIG. 1A, the mattress 26 is in a raised state. On the other hand, as shown in FIG. 4A (to be described further herein), the mattress is shown in a lowered state. The lowered state is closer to the ground or floor upon which the crib 10 is positioned than the raised state. As such, the depth inside the crib is adjustable.

The side rail 12 generally includes a top bar 22 and a bottom bar 24 positioned approximately parallel to one another. A plurality of generally vertically-spaced side support elements 20 (i.e. slats) extend between the horizontal top bar 22 and horizontal bottom bar 24. Although less prevalent due to crib regulation, the side rail 12 in some older cribs is moveable from a raised state to a lowered state. For example, the moveable side rail 12 allows a user to lower the side rail 12 in order to have easier access to a child lying on mattress 26. As shown in FIG. 1A, side rail 12 can be raised or lowered relative to support structure element 39 and the remainder of the crib 10. The present invention allows for the side rail 12 to be moved from a lowered state to a raised state, or vice versa, even with the crib shield system 40 attached to the crib 10. Of course, typical cribs today do not have a moveable side rail, and the present invention also address these cribs. In addition, cribs may or may not have slats on one or more sides as the current trend in cribs is to have a crib that is convertible to a toddler bed, using one or more of the crib sides (or foot and head boards) as the foot and/or headboard of the toddler bed. In some cribs typical corner posts are not apparent. Therefore reference to a corner post herein does not strictly refer to a

structural member at the corner of the crib and can also include where two sides meet.

Side rail 14 may be similarly configured like that of side rail 12. In other words, side rail 14 may be moveable from a lowered to a raised state, and vice versa. However, side rail 14 may also be in a stationary position fixedly attached to corners 36, 31. Likewise, side rail 12 may be moveable or in a fixed position. As moveable side rails are conventional configurations, no further description is provided with respect to the mechanisms for allowing such movement thereof. In addition, any of the sides of the crib may or may not include slats and the crib may or may not include corner posts. The crib shield systems described herein work with various mechanisms for moving side rails, e.g., side and bottom latch systems and gliding side mechanisms, fixed rails, rails with no slats, or cribs with no corner posts.

Headboard 18 of crib 10 includes an upper bar 32 (e.g., in a decorative curved shape) as well as a bottom horizontal element 43, each connected in a fixed position to corners 36, 38. In a similar manner to the side rails 12, 14, generally vertically-spaced support elements 34 extend between the top bar 32 and the horizontal element 43. It will be recognized that many cribs may or may not have spaced support elements that define a part of the footboard 16 or headboard 18. For example, the headboard and footboard may be solid materials as opposed to spaced-apart supports. The footboard 16 is configured in a manner like that of headboard 18 and includes corners 31, 33. Of course, in certain cribs there may or may not be corner posts, e.g. the convertible crib. Therefore the term "corner post" could simply be where two sides meet.

As shown in FIG. 1A, the plurality of spaced-apart side support elements 20, 34 of the side rails 12, 14 and the headboard and footboard 16, 18 are used to define the interior boundary extending proximate and around the periphery of the mattress 26 disposed within the crib 10. In one embodiment, and as shown in FIG. 1A, at least one panel is sized for covering at least a portion of the plurality of spaced-apart side support elements and configured to extend along at least a portion of the interior boundary. Of course, if there are no spaced-apart side support elements and there is a solid panel, the one panel would still cover the side. As is described herein, in one preferred embodiment, a significant amount of the panel is formed of a breathable material and the panel includes at least one fastening apparatus for securing at least one panel to the crib 10.

As used herein, the term mattress may include any structure disposed within crib 10 and upon which objects and/or human beings may be placed. In other words, mattress refers to any structure and not just a soft sleeping apparatus. For example, the crib could be configured into a playpen-type structure with a solid hard and/or flat bottom that is, for example, lowered very close to the floor. As such, and as used herein, a crib can be equated to and encompasses the various structures similar to a crib, such as those for containing a small child (e.g., playpens, portable cribs, convertible cribs, round cribs, or other structures including, for example, spaced-apart side supports which require an apparatus or system such as that described herein).

As further shown in FIG. 1A, crib shield system 40 is attached to crib 10 along a portion of the interior boundary of the crib 10 defined by the headboard 18, footboard 16, and side rails 12, 14. As shown in FIG. 1A, a first side panel 42 is attached to side rail 12. Further, a second side panel 44 is attached for covering side rail 14, footboard 16, and headboard 18. However, one skilled in the art will recognize that the second side panel 44 may also be configured to cover just

the second side rail **14** and the footboard **16** (e.g., such as when the headboard **18** lacks vertical spaced-apart side support elements), or may cover just side rail **14** and headboard **18** (e.g., such as when footboard **16** lacks spaced-apart side support elements). In other words, the configuration of the second side panel **44** may differ depending upon the configuration of crib **10** upon which it is attached. Likewise, the configuration of the first side panel **42** may differ depending upon the configuration of crib **10** upon which it is attached. In addition, the attachments may be different if attaching to a rail with no slats, for example.

In another embodiment of the crib shield of FIG. 1A, the crib shield may extend nearly the full height of the crib. FIG. 1B shows a perspective view of one embodiment of a single-wrap crib shield system attached to a crib with a side rail of the crib in a raised or fixed state. A crib shield **111** may include wraps **110a**, **110b**, and **110c** positioned at different vertical locations along the crib shield **111**. The wraps **110a**, **110b**, and **110c** may be Velcro, ties, snaps, zipper, or any other suitable fastener. The crib shield **111** may be fastened to the crib **10** through fasteners **114** and **116**. The fasteners **114** and **116** may be located anywhere along the vertical height of the crib shield **111** or perimeter of the crib **10**.

The crib shield of FIG. 1B illustrates a single wrap full height shield, but additional wraps may be used to secure the crib shield. FIG. 1C shows a perspective view of one embodiment of a double-wrap crib shield system attached to a crib with a side rail of the crib in a fixed or raised state. The crib shield **111** of FIG. 1C includes second wraps **112a** and **112b** located at different vertical heights along the crib shield **111**.

The various wrap types are illustrated in FIGS. 1D-1F. FIG. 1D shows a side view of one embodiment of a hook and loop Velcro attachment. Velcro **113a**, **113b**, and **113c** located at different vertical positions may attach to Velcro receptors **113d**, **113e**, and **113f**, respectively. FIG. 1E shows a side view of one embodiment of tie attachments. Ties **115** may be loose pieces of string located on ends of the crib shield or locations along the perimeter of the crib shield to allow an individual to tie one of the ties to another tie. FIG. 1F shows a side view of one embodiment of snap attachments. One side of the crib shield may include snap receptors **117b** while another side of the crib shield may include snap attachments **117a**. An individual snaps on the of the snap receptors **117b** to a snap attachment **117a** to secure the crib shield. A crib shield with snap attachments **117a** and **117b** allows an individual to custom size the crib shield by selecting where to couple a snap attachment to a snap receptor. Of course, one of ordinary skill would recognize there are multiple attachments available and multiple ways to attach the crib liner to the crib.

FIG. 2A shows the first side panel **42** in an unattached laid flat position. The first side panel **42** includes a body **46** formed of a mesh-type material that extends along the length (L panel **1**) from a first end **48** of the first side panel **42** to a second end **50** of the first side panel **42**. The length (L panel **1**) of the first side panel **42** is sized for allowing attachment to the side rail **12** of crib **10**. For example, the length (L panel **1**) is slightly longer than the distance between spaced-apart side support elements **27**, **29**. In such a manner, the first side panel **42** can be wrapped about such side support elements **27**, **29** and fastened thereto using hook and loop closures **52**, **54**, as is further described herein with reference to FIG. 3A.

In many embodiments, the body portion **46** has a width (e.g., W panel **1**) that is less than a length (e.g., L support as shown in FIG. 1) of a vertical spaced support element **20** of

the first side rail **12**. In many embodiments, the width (e.g., W panel **1**) is less than one-half the length (L support) of the vertical spaced side support element **20**. In alternate embodiments, the crib liner is configured to be secured to a crib such that a portion of the liner (e.g., lower trim section) is located between the mattress and the crib, and as such, the breathable material of the liner exposed to an infant in the crib is not reduced by liner edging or trim sections composed of less breathable materials. In many embodiments, the crib liner is configured to provide breathable material along the side rails and endboards such that the head of an infant lying in the crib is exposed to breathable material. In preferred embodiments, the panel will have at least a four (4) inch width of breathable material, or greater, so that an infant resting against a side rail or endboard will only be exposed to the breathable material. It is less relevant if top and bottom boarders are breathable as they are not in the area of the infant's head. Therefore, it is possible that a liner be 12 or more inches in height as long as there is approximately 4 inches of breathable material in the area of the infant's head. In this example embodiment, the mesh may be only 33% of the total height of the liner, but it is substantially mesh near the infant's head where breathability matters most. In many embodiments, the breathable material will be configured to provide between five inches to eight inches or more of breathable material. It should be understood that the portion of breathable material may be adjusted based upon the average head size of an infant, which may be determined using available Center of Disease Control (CDC) data (e.g., average infant head circumference data). In most embodiments, the critical width of breathable material is the portion that extends from the top edge of the crib mattress and extends upward to the top of an average baby's head.

The first side panel **42** includes a first fastening apparatus **52** at the first end **48** of the first side panel **42** and a second fastening apparatus **54** at the second end **50** of the first side panel **42**. Fastening apparatus **52** includes fastening portions **53**, **55**, such as hook and loop closures (e.g., Velcro). In one embodiment, fastening apparatus **54** is the same as fastening apparatus **52**, however, such closure structures may also be different.

Various fastening apparatus may be used to attach the first side panel as well as the other panels as described herein to a crib. For example, various types of fastening apparatus may include hook and loop closures (e.g., Velcro), snaps, buttons/buttonholes, ties, straps, buckles, zippers, etc. Although hook and loop fasteners are preferable, any other closure or fastener apparatus suitable for attaching panels to crib **10** may be used.

In one embodiment, a finishing edge material **58** is provided along the periphery of the body portion **46**. For example, as shown in FIG. 2A, a finishing edge material (e.g., a decorative material) may be used along edges **61-64**. The finishing edge typically does not affect the breathability of the liner since it is not in close proximity to the infant's head.

FIG. 2B shows the second side panel **44** in an unattached laid flat position. The second side panel **44** includes a body portion **70** that extends along a length (L panel **2**) from a first end **72** thereof to a second end **74** of the second side panel **44**. The length (L panel **2**) of the second side panel **44** is sized for allowing attachment to footboard **16** and headboard **18** and across side rail **14** of crib **10**. For example, the length (L panel **2**) is slightly longer than the combined lengths of the three sides of the crib **10** (i.e., the lengths of the footboard **16**, headboard **18**, and side rail **14**). In such a manner, the second side panel **44** can be wrapped about

support elements **19, 35** and fastened thereto using hook and loop closures **76, 78**, as is further described herein. Further, the second side panel **44** has a width (W panel **2**) that, at least in one embodiment, has substantially the same width as the width (W panel **1**) of first panel **42**.

Further, second side panel **44** includes fastening apparatus **76** at first end **72** of the second side panel **44** and fastening apparatus **78** at the second end **74** of the second panel **44**. Such fastening apparatus **76, 78** are substantially similar to the hook and loop fasteners described with respect to first panel **42**. Further, in a like manner, finishing edge material **80** may be used around the perimeter of the body portion **70** as shown by the finishing material **80** along edges **81-84**.

The mesh-type material of the body portion **46** of first side panel **42** and body portion **70** of second side panel **44** may include any suitable material that provides breathable functionality such as a mesh type material. Breathable functionality refers to the ability of the material to allow air to move effectively therethrough. As used herein, when air is indicated as moving effectively through a material, it is meant that the material includes openings (e.g., mesh openings, open-framework, spaces between elements thereof, or even those that may not be visually perceivable openings but still allow a breathable function to occur) that do not impede air movement to an extent that would prevent a human being from breathing through (e.g., when a human's respiratory openings (e.g., nose/mouth) are in direct contact with a material) such a material in order to prevent suffocation and further that such openings are too small to permit an infant to insert a finger or toe therethrough. For example, such materials may include cotton, silk, polyester, nylon, modal/semi-cellulose based fabrics, etc.

In one embodiment, the mesh-type material may include a mesh available from Apex Mills, Inc. under the trade designation TAI Mesh. However, other various similar mesh materials (e.g., mesh material having suitable openings) are available. A Suffocation Hazard Assessment was performed by RAM Consulting (Oak Brook, Ill.) (e.g., the Assessment is further described herein and for which protocol is available from RAM Consulting) on the TAI Mesh resulting in average readings of 1.6 cm H<sub>2</sub>O and, for an upper specification limit of 5 cm H<sub>2</sub>O, a Z-value of 9.0 was obtained.

In most embodiments, the breathable material is a breathable mesh-type material **300** (e.g., a padded spacer mesh), such as that shown generally in FIGS. **2C-2F**. The breathable material **300** includes openings **349** on a front substructure **391** thereof, as shown in top view of the material **300** of FIG. **2C**. As shown in the cross-section of the breathable padded mesh material **300** in FIG. **2F**, the material **300** further includes a back substructure **392**. A pile substructure **393** may be integrated with or simply attached at certain locations and extend between the front and back substructures **391, 392**. Each of the substructures (e.g., the front, back, and pile substructures) allows air to substantially move effectively therethrough. The material **300** is further shown in the perspective views of FIGS. **2D-2E**. As illustrated, and in most embodiments, pile substructure **393** is generally linear (some wave and collapsing may occur) when extending between the front substructure **391** and back substructure **392**. This linear configuration generally provides optimal air flow between the front and back substructures. However, in a few alternate embodiments, it may be beneficial to use a pile substructure **393** that is less than linear, whether lofted, matted, and/or bunched fibers. This may be done to improve padding properties, especially with padding that is sufficiently breathable. In a few alternate embodiments, the

substructure **393** is attached only to the front substructure **391** or the back substructure **392**.

The meshes or other fabrics shown in FIGS. **2A-2F** may include designs on the mesh. FIG. **2G** shows an illustration of a printed mesh according to one embodiment of the disclosure. FIG. **2H** shows an illustration of a printed mesh according to another embodiment of the disclosure.

It will be recognized that the thickness of the padded mesh material may vary, as well as for other materials described herein. For example, more padding may create a softer more plush effect with slightly different breathability/ventilation properties and more opaqueness (e.g., less light transmissive) whereas less padding may create more breathability and buoyancy with less opaqueness (e.g., more light transmissive). Preferably, the panels described herein are at least somewhat transparent such that at least motion of the child in the crib can be seen.

Yet further, the padded mesh material is collapsible. As such, when installed or uninstalled, should a child stand on it, the material will collapse. This reduces the risk of the mesh material being leverage to a climbing infant (unlike most conventional bumpers).

The breathable material may be a woven polymeric fiber mesh material that is integrated with or attached to a front and/or back substructure **391, 392**. The front substructure **391** may include larger openings on the front substructure **391** than on the back substructure **392**. In one example embodiment, the padded mesh material **300** may be integrated with or attached to the front and back substructures **391, 392** by weaving the fibers that are provided as part of the pile substructure **393** through the front and back substructure **391, 392** as shown in FIG. **2D-F**. In another embodiment, the breathable material may be integrated by sewing, or otherwise attaching, the padded mesh material **300** between a front and back substructure or other substructures (not shown). That is, in this embodiment the padded mesh material is integrated by attaching to other materials, such as breathable materials or pad materials, to form a multi-layer structure (not shown). The multi-layer structure may be, for example, laminated or quilted.

In one embodiment, for example, the breathable padded mesh material **300** may include a padded spacer mesh available from Apex Mills, Inc. under the trade designation DNB27 Spacer Mesh. However, other various similar padded spacer mesh materials are available.

In another embodiment, the mesh-type material is a breathable padded mesh material in combination with one or more other material layers. For example, the breathable padded mesh material may be used in combination with one or more layers of other material adjacent to (e.g., one material laid flat against the other) either the front substructure and/or back substructure of the breathable padded mesh material. In various embodiments of such a combination, one or more layers of material may be used adjacent the front substructure, one or more layers of material may be used adjacent the back substructure, or one or more layers of material may be used adjacent the front substructure and the back substructure. For example, such additional layers may be layers of cotton material, knit jersey material, etc. Such additional material layers may provide additional benefits such as, for example, thermal properties with breathability.

Further, for example, the breathable material when used alone, or in combination with one or more additional layers, may be a breathable material (e.g., a breathable padded mesh material, such as a spacer mesh) that has a suffocation resistance level of less than about 15 cm H<sub>2</sub>O, and preferably less than about 5 cm H<sub>2</sub>O. Such a suffocation

resistance is determined according to the RAM Consulting Virtual Child Suffocation Hazard Assessment Model which is a physical model and testing methodology that quantitatively assesses the potential suffocation hazards posed by various types of materials. The details of this Model are available from RAM Consulting (Oak Brook, Ill.). Further, according to this Model, Z-values are determined that are statistical measurement tools that describe and predict product performance in relation to its specification limit (e.g., such as those described below). For example, the suffocation resistance limit of 5 cm H<sub>2</sub>O is an upper specification limit for materials or products that foreseeably are used and/or intended for young infants with high accessibility; and further, the suffocation resistance limit of about 15 cm H<sub>2</sub>O is an upper specification limit for other materials or products (e.g., those for toddlers). A Z-value of 4.0 or greater with the corresponding upper specification limit for each applicable testing technique is required for a product to be classified as a very low suffocation risk. The details regarding the determination of Z-values are available from RAM Consulting (Oak Brook, Ill.).

Suffocation Hazard Assessment was performed by RAM Consulting (Oak Brook, Ill.) on various configurations using the breathable padded mesh material available from Apex Mills, Inc. under the trade designation DNB27 Spacer Mesh.

1 Configuration 1: Single Layer of Padded Spacer Mesh  
 Configuration 2: Layer 1: Padded Spacer Mesh Layer 2: Cotton  
 Configuration 3: Layer 1: Knit Jersey Layer 2: Padded Spacer Mesh Layer 3: Cotton  
 Configuration 4: Layer 1: Cotton Layer 2: Padded Spacer Mesh Layer 3: Cotton  
 Configuration 5: Layer 1: Knit Jersey Layer 2: Padded Spacer Mesh Layer 3: Knit Jersey  
 Configuration 6: Layer 1: Padded Spacer Mesh Layer 2: Flannel  
 Fabrics tested: Knit Jersey Manufacturer: NATEX Content: 50% Polyester/50% Cotton Knit Jersey Style#: INT Cotton Manufacturer: SOUTHERN BELLE Content: 100% Cotton Style#: L93N67 Flannel Manufacturer: QUILTERS CORNER Content: 100% Cotton Style#: RN41324.

A screening was performed on all configurations in both a dry and wet state. The spacer padded mesh when layered with fabrics resulted in a satisfactory reading based on values in cm H<sub>2</sub>O, wherein the specification upper limit for products young children are intended to lie on is equal to 5 cm H<sub>2</sub>O (e.g., mattress pads or items young infants are intended to have their face on) and wherein the specification for products young children are not intended to lie on is equal to 15 cm H<sub>2</sub>O.

Four individual readings were performed with an average being determined. Dry state readings did not register, thus presenting very low hazard when the configurations were dry (i.e., under the 5 cm H<sub>2</sub>O specification limit). In the wet state (after application of 8 ml of sprayed on water), the average readings for the configurations were between 4.6 cm H<sub>2</sub>O and 6.2 cm H<sub>2</sub>O.

For the individual single layer of spacer padded mesh, average readings of 1.7 cm H<sub>2</sub>O were taken. Further, for an upper specification limit of 5 cm H<sub>2</sub>O, a Z-value of 9.5 was obtained.

As shown in FIG. 1A, the first side panel 42 is attached to first side rail 12 by wrapping first end 48 of the first spacer panel 42 about spaced side support element 27 and mating the hook and loop fastener portions 53, 55 as shown in FIG. 3A. The second end 50 of first spacer panel 42 is wrapped around side support element 29 and fastening apparatus 54 is used to hold the first side panel in place. For example, in one embodiment, the fastening apparatus 54 is attached to the side support element 27. Thereafter, the user pulls the

panel taut across the plurality of spaced side support elements 20 by pulling on the second end 50 containing the fastening apparatus 54. Fastening apparatus 54 is the attached to support element 29 in such a manner to hold the taut panel in place. As such, the first side panel 42 is prevented from slipping after being attached to the spaced side support elements 27, 29. Of course other suitable methods of using the liner are contemplated.

In at least one embodiment, the first side panel 42 is configured to cover at least a portion of the first side rail 12 and to extend along the length of the crib 10. As used herein when a panel extends along the length of the crib 10, it will be recognized that the panel may not extend completely along the entire length, but may end proximate the headboard and footboard. For example, depending upon the fastening techniques used, the panel may be attached a short distance from the corners of the crib (see panel 42 as shown in FIG. 1A).

In a like manner, second side panel 44 is attached to the crib 10. For example, the second end 74 of the second side panel 44 is wrapped about spaced support element 35 of headboard 18. Fastening apparatus 78 (e.g., Velcro closures) is used to fasten the second end 74 about the support element 35.

Further, as shown in FIG. 1A, the body portion 70 of the second side panel 44 is fed to the inside of the crib 10 (e.g., to the inside portions of support elements 34) and thereafter fed to the outside of the crib 10 and around corner 36. The body portion 70 is continued to be fed back into the inside of the crib 10 (e.g., to the inside of the support elements of the second side rail 14) and thereafter fed once again to the outside of the crib 10 and around corner 31 (see FIGS. 3B-3C). Thereafter, the body portion 70 of the second side panel 44 is fed to the inside of the crib 10 once again at the footboard 16 and then wrapped around support element 19 of footboard 16 in a similar manner to the fastening of the second side panel 44 around support element 35 of headboard 18.

One will recognize that the second side panel may be attached to any number of different support elements, may be fed around and/or to the outside of one or more spaced support elements, and, as with the first side panel 42, is pulled taut prior to fastening to keep the second side panel 44 in position. Further, the weaving of the second side panel 44 around the corners and/or around one or more of the spaced support elements also assists in maintaining the second side panel 44 in position (e.g., in a position higher on the crib 10 when the mattress is raised relative to the floor and lower in the crib 10 when the mattress is lowered to the floor). In addition, any of the panels may be positioned such that a portion of the panel is below the upper surface of the mattress (e.g., a few centimeters below the surface along the side of the mattress) to assist in securing the crib and preventing arms and legs from going under the panel.

In another embodiment, the crib shield system may comprise a single side panel. As contemplated herein, the crib shield system or crib liner may be one or more panels and may or may not include a bottom panel. As shown in FIG. 1B, the crib 10 is substantially the same as that shown in FIG. 1A except that the side rail 12 is fixed and cannot be lowered or raised.

The single side panel 111, as shown in FIG. 1B, includes a body portion 70 that extends along a length (L panel 3) from a first end 72 thereof to a second end 74 of the single side panel 111, in a like manner with the second side panel 44 in FIG. 2B. The length (L panel 3) of the single side panel 111 may be sized for allowing attachment to footboard 16

13

and headboard 18 and across side rail 12 and 14 of crib 10. For example, the length (L panel 3) is slightly longer than the combined lengths of the four sides of the crib 10 (i.e., the lengths of the footboard 16, headboard 18, side rail 12, and side rail 14). In this embodiment, the single side panel 111 may be wrapped about support elements 35, installed along all four sides of the crib, and fastened to support elements 27 using hook and loop closures, as shown in FIG. 3A. Further, the single side panel 111 may have a width (W panel 3) that, at least in one embodiment, may have substantially the same width as the width (W panel 1) of first panel 42.

Further, as shown in FIGS. 1B-1C, single side panel 111 may include fastening apparatus 110a-c at first end of the single side panel 111 and fastening apparatus at the second end of the single side panel 111. Such fastening apparatuses 110a-c are substantially similar to the hook and loop fasteners described with respect to first panel 42. In one embodiment, finishing edge material 80 may be attached around the perimeter of the body portion 70 as shown by the finishing material 80 along edges 81-84.

In one embodiment as shown in FIG. 1B, the single side panel 111 may be attached to headboard 18 by wrapping first end 72 of the single side panel 111 about spaced side support element 35 and mating the hook and loop fastener portions 110a-c, as shown in FIG. 3A.

Further, as shown in FIG. 1B, the body portion 70 of the single side panel 111 may be fed to the inside of the crib 10 (e.g., to the inside portions of support elements 34) and thereafter fed to the outside of the crib 10 and inside corner 36. The body portion 70 may be continued to be fed back into the inside of the crib 10 (e.g., to the inside of the support elements of the second side rail 14) and thereafter fed once again to the outside of the crib 10 and inside corner 31 (see FIGS. 1B, 1C). Thereafter, the body portion 70 of the single side panel 111 may be fed to the outside of the crib 10 once again at the footboard 16 and then fed inside of corner 33 to the inside of the crib 10 (e.g., to the inside portions of support elements 20). Finally, the second end 74 of single side panel 111 may be wrapped around side support element 27 and fastening apparatus is used to hold the single side panel in place. Thereafter, the user may pull the panel taut across the plurality of spaced side support elements on all four sides of the crib by pulling on the second end 74 containing the fastening apparatus. Fastening apparatus may be attached to support element 27 in such a manner to hold the taut panel in place. The single side panel 111 may be deterred from slipping after being attached to the spaced side support elements 35, 27.

As shown in the exemplary embodiment of FIG. 4A, the crib 10 is substantially the same as that shown in FIGS. 1A-1C except that the mattress 26 is in a lowered position. However, the side rail 12 is a side rail that can be lowered or raised, as desired. Like the crib shield system 40 in FIG. 1A, the illustrated embodiment of crib shield system 100, shown in FIG. 4, allows the side rail 12 to be moved even with the crib shield system 100 attached to crib 10.

The illustrated embodiment of crib shield system 100 includes a first side panel 102 and a second side panel 104 for attachment to respective side rails 12, 14. Further, the crib shield system 100 includes a first end panel 106 for attachment to the footboard 16 and a second end panel 108 for attachment to the headboard 18.

FIG. 4B shows a perspective view of another embodiment of a full crib shield system attached to a crib. A mesh 411 extends around a crib 401. A number of ties 415 attach side rail covers 417, a back rail cover 419, and a front rail cover 421 to the mesh 411. A hidden zipper (not shown) may attach

14

a front side of the rail covers 417, 419, and 421 to the mesh 411. The hidden zipper may be concealed by a flap 407, such as in a gusset pocket. In some embodiments, the rail covers 417, 419, and 421 may be available as upgrades to a basic mesh crib liner 411. The rail covers 417, 419, and 421 may be a solid color or include patterns and be made of washable material with quick drying capability.

FIG. 5 shows a first side panel 102 of an exemplary crib shield system 100 in an unattached laid flat position. The first side panel 102 includes a body portion 120 formed of a mesh-type material. In one embodiment, the mesh-type material is an open framework material that includes openings too small to permit an infant to insert a finger or toe therethrough. However, any breathable material known to a person of ordinary skill in the art may be used, such as the breathable materials described herein.

The body portion 120 extends along a length (L panel 1) extending from a first end 122 of the first side panel 102 to a second end 124 thereof. Further, the laid flat first side panel 102 has a width (W panel 1) that is sized to cover at least a substantial portion of side rail 12.

As used herein, when referring to the covering of a substantial portion of a side rail (or headboard or footboard), at least two-thirds of the side rail 12 is covered. However, the first side panel may cover less than a substantial portion. For example, the first side panel may cover just a majority of the entire side rail 12.

The first side panel 102 further includes a fastening apparatus 126 that extends along an entire edge 144 of the side panel 102 for use in attaching the side panel 102 to the top bar 22 of the side rail 12, as is shown in further detail in FIGS. 6A-6D. The fastening apparatus 126, at least in one embodiment, includes first and second fastening portions 147, 148 that are both for mating with one another in order to hold the first side panel 102 in a fixed position relative to side rail 12.

In various embodiments, the fastening apparatus 126 may be a series of straps or ties intermittently disposed along the edge 144 of the side panel 102 for use in attaching the side panel 102 to the top bar 22 of the side rail 12, as is shown in further detail in FIGS. 18-20 below. Each of the straps or ties of fastening apparatus 126, at least in one embodiment, includes first and second fastening portions 147, 148 that are both for mating with one another in order to hold the first side panel 102 in a fixed position relative to side rail 12.

As shown in FIG. 6A, the exemplary fastening apparatus 126 may include a padded portion 150 that is wrapped around top rail 22 such that first and second fastening portions 147, 148 can be placed in contact with one another. As a result, the padded portion 150 covers the top bar 22 of the side rail 12. With use of the fastening apparatus 126 that extends along the entire edge 148 of the first side panel 102, the first side panel 102 can be fixed in a stable position with respect to side rail 12. For example, the first side panel 102 can be fixedly positioned to prevent movement thereof relative to the side rail 12 using one or more other various fastening apparatus.

In another embodiment, the padded portion 150 may be removably attached to the fastening apparatus 126. For example, the padded portion 150 may comprise a strip of padded material with one fastening side, the fastening side designed to be removably attached to the fastening apparatus 126 using hook and loop fasteners, snaps, zippers, or other appropriate fastening apparatus. The padded material may be any suitable material, not just the aforementioned mesh-type material.

## 15

For example, as shown in FIG. 5A, closures 127-128 provide for additional affixing functionality about the top bar 22 of the crib 10. In addition, closures 129-130 assist in affixing the first side panel 102 to respective corners 38, 33. Yet further, for example, a plurality of closures 131-133, located opposite the edge 144 can be used to attach the first side panel 102 to bottom bar 24 of the side rail 12 such that the panel 102 is held in a taut manner across the plurality of support elements 20.

FIG. 5B shows a back side of a crib shield mesh according to the present invention. A crib shield 102 may include one or more ties 115 along a top end of the crib shield 102. The ties 115 may allow connection of the crib shield 102 with a rail cover described below with reference to FIG. 5D. Although not shown, the ties 115 may also be coupled to a bottom end of the crib shield 102. The crib shield 102 may also include a number of Velcro loops 113 including Velcro attachments 113a, 113b, and 113c, and Velcro receptors 113d, 113e, and 113f. The receptors 113d, 113e, and 113f may loop around a support structure (not shown), such as a crib, and hook around to couple to the attachments 113a, 113b, and 113c.

FIG. 5C shows a front side and several magnified views of a side panel for use in a crib shield system according to the present invention. The crib shield 102 of FIG. 5C may illustrate a side of the crib shield 102 facing an inside of a crib. In one embodiment, the crib shield 102 may have a size of approximately 128 inches by approximately 19.5 inches, although various sizes may be configured to fit different crib sizes and shapes. A fastener 105a may couple the crib shield 102 to a front/back crib rail cover 103 through a fastener 105b. The cover 103 may have a size of approximately 46 inches by approximately 14 inches. The fastener 105a and 105b may be a half of a zipper and the zipper pull located on one or the other of fastener 105a and 105b. For example, the rail cover 103 may include the zipper pull 105b, such as a dual separating zipper, which may be opened or closed from either end. A flap 107 may extend over the fastener 105a to conceal the zipper. Although a zipper is illustrated connecting the crib shield 102 and the rail cover 103, other fasteners such as buttons, snaps, and ties are possible. A second rail cover may be used for sides of a crib. FIG. 5D shows a side view of a second crib rail cover. The cover 107 includes ties 115 for coupling to the ties 115 of the crib shield 102 illustrated in FIG. 5B.

The rail cover 103 may include multiple layers of material. FIG. 5E is an illustration of a rail cover having multiple layers of fabric. For example, the cover 103 may include an outer layer 151 such as mesh fabric, a middle layer 153 such as a padded filler, and a bottom layer 155 such as a waterproof layer, allergen-blocking layer, or other fabric. The cover 107 may have a size of approximately 27 inches by approximately 14 inches.

One skilled in the art will recognize that many types of closures may be used to provide the attachment functionality, such as those described previously herein with respect to crib shield system 40. In one particular embodiment, all of the closures are provided with hook and loop fasteners (e.g., Velcro fasteners). In such a manner, no ties are necessary, which eliminate additional material that could be grabbed by a small child and pulled upon.

FIGS. 6A-6D show further detail illustrating the attachment of the first side panel 102 to the crib 10. FIG. 6A shows the fastening apparatus 126 wrapped around the top bar 22 of the crib 10 and, in particular, a closure 130 wrapped around post 33 but not yet in a closed position.

## 16

FIG. 6B shows the closure 130 in a wrapped around configuration and closed (e.g., the hook and loop fasteners in direct contact with one another and providing attachment to corner post 33).

FIG. 6C shows the fastening apparatus 126 in further detail, including fastening portions 147-148 and closure 127 in a partially unattached configuration.

FIG. 6D shows a cross-section view of the top bar 22 having the padded rail cover portion 150 wrapped therearound.

FIG. 6E shows one of the bottom closure strap attachments 133 used to wrap around bottom bar 24. The strap attachment 133 is shown in a partially closed position with a part of the hook and loop fasteners in direct contact.

FIG. 6F shows a cross-section of the bottom bar 24 having strap attachment closure 133 wrapped therearound and in a fastened configuration.

It will be readily understood that second side panel 104 is substantially similar to that of first side panel 102. In addition, the attachment of second side panel 104 to side rail 14 is performed in substantially the same manner as the attachment of first side panel 102 to side rail 12 of crib 10.

FIG. 7A shows an exemplary end panel 108 in an unattached laid flat position. The end panel 108 includes a body portion 160 of mesh-type material like that described with respect to first side panel 102 which extends along a length (L panel 2) from a first end 162 to a second end 164 of the end panel 108. Further, the end panel 108 has a width (W panel 2) that along with length (L panel 2) is sized to cover a substantial portion of headboard 18. The end panel 108 includes fastening apparatus 166, for example, along the entire edge 183 of the body portion 160 for use in attachment of the end panel 108 to a support element 37 of the headboard 18. The fastening apparatus 166 includes fastener portions 168-169 and a body portion 170. The body portion 170 is wrapped around the support element 37, as shown in further detail in FIG. 8, with the fastener portions 168-169 placed in direct contact with one another to provide attachment of the end panel 108 to the headboard 118. The fastener portions 168-169 are preferably hook and loop fasteners to provide a consistent closure along the entire width (W panel 2).

At least one other fastening apparatus, such as fastening apparatus 176, are provided at one or more positions along an edge 184 opposite edge 183 to allow a user to pull the panel taut across the headboard 118 when fastening apparatus 166 has been attached to support element 37. Such fastening apparatus 176 can be thereafter used to secure the end panel 108 around support element 35 and maintain the end panel 108 in a taut position adjacent the support elements 34. In one embodiment, the fastening apparatus 176 includes hook and loop fasteners 177-179 (e.g., Velcro closures) positioned along edge 184 using a body of material 193 that can be wrapped about support element 35.

FIG. 7B shows a back side of a back panel wrap for attaching to a rail cover according to the present invention. The short back panel 108 may include a number of ties 115 for coupling to a rail cover. The short back panel 108 may also include a number of hook and loop fasteners 178 and 179.

FIG. 7C shows a front side of a back panel wrap for attaching to rail cover according to the present invention. The front side of the short back panel 108 may face an inside of a crib. The back panel 108 may include a receptor 105a for coupling to a rail cover. The receptor 105a may be, for example, one half of a zipper or one half of a zipper with a

zipper pull. The flap **107** may conceal the receptor **105a**. The back panel **108** may have a size of approximately 56 inches by approximately 22 inches.

FIG. **8** shows an illustration of attaching the end panel **108** to headboard **118**. For example, as shown therein, closure **177** is in an unattached configuration, whereas closures **178**, **179** are in a fastened configuration. Likewise, fastening apparatus **166** along the first end **162** of the end panel **108** is shown in a partially fastened configuration.

It will be readily understood that a second end panel **106** may be substantially similar to that of first end panel **108**. In addition, the attachment of second end panel **106** to the footboard **16** is performed in substantially the same manner as the attachment of first end panel **108** to headboard **18** of crib **10**.

Both the side panel **102** and the end panel **108** may be provided with associated finishing material for functional or decorative purposes (e.g., to prevent the fraying of mesh material of body portion **120**, to provide further padding, etc.). For example, as shown in FIG. **5A**, finishing edge material **138** may be used along edges **141-143**. Likewise, as shown in FIG. **7A**, finishing material **172** may be used along edges **181-182**. Further, it will be recognized by one skilled in the art that various types of materials may be used along the edges and in combination with various fastening apparatus for attaching the panels to the crib **10**. However, preferably, the exposed portions of the panels (e.g., exposed to a child in the crib) are formed of the mesh-type material, while the finishing edge material may be less breathable.

In another embodiment, the crib shield system may comprise a crib liner with two side panels **106,108**, two end panels **102,104**, and a bottom panel **428**, where the side and end panels are attached to the bottom panel, as is shown in further detail in FIGS. **20A-20B**.

FIGS. **9A-9C** show illustrations of exemplary breathable materials according to various embodiments of the present invention. FIG. **9A** illustrates an exemplary breathable material **900**. In the illustrated embodiment, the breathable material **900** includes a front substructure **391** composed of a woven material. The woven portion of the front substructure **391A** is illustrated at **902**. The woven material **902** is the portion of the front substructure **391A** with which a pile substructure **393** may be attached and/or integrated. The woven material **902** is configured with openings **904**, which are voids lacking any material. These openings **904** do not have any pile substructure **393** attached, and as such, may be configured to create channels between the front substructure and the back substructure. An exemplary opening **904** may be 1-6 millimeters and preferably 2-4 millimeters in diameter. As illustrated, the exemplary openings **904** are round, although other shapes are available (e.g., oval, triangle, etc.).

FIG. **9B** illustrates an exemplary breathable material **920**. In the illustrated embodiment, the breathable material **920** includes a front substructure **391B** with a plain weave woven portion **922** with openings **924**, thereby creating a "netting" pattern. In this exemplary weave configuration, the woven portion **922** is reduced, thereby increasing airflow, but diminishing the distinct channels found in openings **904**. Further, the fine pattern of the woven portion **922** lacks a perceivable ornamental pattern when the liner is viewed as a whole. For this reason, in many embodiments, the breathable material **920** is used as an interior layer when two or more breathable materials are layered together (e.g., embodiments combined to create a more durable crib liner that retains breathability), as further discussed in conjunction with FIGS. **12A-12C**. As shown by openings **904** in FIG. **9B**, the back substructure **392B** may be comprised of

the front substructure **391A** from breathable material **900**. Thus, the fabric pattern of the front substructure need not mirror the fabric pattern of the back substructure in the various embodiments.

FIG. **9C** illustrates an exemplary breathable material **940**. In the illustrated embodiment, the breathable material **940** includes a front substructure **391C** composed of a cableweave fabric. The woven portion of the front substructure **391C** is illustrated at **942**. The woven material **942** is the portion of the front substructure **391C** with which a pile substructure **393** may be attached and/or integrated. The woven material **942** is configured with primary openings **944** (which may also be referred to as first openings), which are voids lacking any material. An exemplary primary opening **944** may be 1-6 millimeters and preferably 2-4 millimeters in diameter, similar to opening **904** of FIG. **9A**. The front substructure **391C** may also include secondary openings **946**, which are smaller than primary openings **944**. Additionally, the woven portion may include even smaller openings **948a** and **948b** (which may also be referred to as third openings) incorporated into the fabric pattern, in which the openings are smaller than openings **942** and **944**. The benefit of two or more opening sizes in the fabric pattern is the ability to create a fabric that has increased breathability by reducing the amount of thick woven portions (e.g., **902**) while maintaining fabric strength by having many interwoven threads. For example, a secondary opening **946** may be located at the intersection of four primary openings (first openings), thus reducing the amount of woven material between the primary openings. As another example, the third openings may be located between the first openings and second openings in order to further reduce the amount of woven material, and as such, further improve the breathability of the breathable material. Such improved breathability of **940** (and **920**) may allow the breathable material to be layered with other breathable material (e.g., **920**, **940**, etc.) to create a layered crib liner, while still maintaining the breathability as discussed above in paragraphs 0067-0068 and 0076-0077. Further, the larger openings **944**, in combination with the other openings, create a perceivable ornamental pattern when the liner is viewed as a whole. Openings **944** and **946** do not have any pile substructure **393** attached, and as such, may be configured to create channels between the front substructure and the back substructure.

The air permeability of breathable materials **900**, **920**, and **940** may allow the breathable material to be layered with other breathable material (e.g. **900**, **920**, **940**, etc.) to create a layered crib liner, while still maintaining the air permeability (CFM).

Testing was conducted by Bureau Veritas in accordance with ASTM D737 standards to determine the air permeability (CFM) of a single layer of breathable material **900**. Additionally, various combinations of layered breathable materials **900**, **920**, and **940**—such as those described in paragraph 0129—were also tested to determine air permeability. The single layer of breathable material **900** with a thickness of 0.13 inches provided an air permeability of 1013.1 CFM, similar to the 1.6 H<sub>2</sub>O discussed in paragraph 0067 above. Adjusting the properties (e.g., thickness, weave pattern, etc.) of the single layer of a breathable material may allow the air permeability to achieve an air permeability of at least 1250 CFM. In contrast, competing crib bumpers provide a CFM of less than 100 CFM. Various combinations of layers of breathable material provided CFM ranging from 384 CFM to above 500 CFM. For example, two exemplary combinations shown in FIGS. **12A** and **12C** provided CFMs of 536.6 and 520.5, respectively. Adjusting the properties

(e.g., thickness, weave pattern, etc.) of the layered breathable material may allow the air permeability to achieve an air permeability of at least 900 CFM.

FIG. 10 shows an illustration of two exemplary breathable materials according to at least one embodiment of the present invention. In particular, breathable material 900 with openings 904 is part of a multi-layer breathable material further including breathable material 920. The large openings 904 of breathable material 900 is evident next to the finer plainweave fabric pattern of breathable material 920.

FIGS. 11A-11B show illustrations of two exemplary compartmentalized portions of a breathable material. FIG. 11A illustrates an exemplary embodiment in which at least one layer of breathable material 1100 is stitched 1130 to create distinct "compartments." These compartments may be stitched 1130 in any ornamental pattern, such as illustrated design. The stitching 1130 may be used to improve the durability of one layer of breathable material, or alternatively, to strengthen liners configured of multiple layers of breathable material. The compartments provide additional rigidity to the layer(s) of breathable material, especially configurations of crib liners that have more than one layer of breathable material. For example, the compartmented breathable material 1100 resists torsional strain better than breathable material that is not compartmented/quilted. Further, the compartmented breathable material 1100 may be more durable over repetitive wash cycles, and further, less susceptible to deformity as a result of being repetitively compressed/crushed (e.g., an infant repeatedly stepping on the crib liner). FIG. 11B illustrates an exemplary embodiment in which at least one layer of breathable material 1120 is embossed, thereby forming compartments similar to those illustrated by FIG. 11A. The embossing 1150 may be limited to one layer of breathable material 1120 (which may be configured of a front, pile, and back substructure) or may connect two or more layers of breathable material. The embossing of breathable material improves the properties of the breathable material 1120 in the same manner that the stitching improved the properties of breathable material 1100. Typically, heat and pressure is used to emboss the one or more layers of breathable material 1120.

FIGS. 12A-12C show illustrations of various exemplary breathable material combinations composed of more than one layer of breathable material according to multiple embodiments of the present invention. FIG. 12A illustrates an exemplary crib liner cross section 1200 configured with two layers of breathable material, 1202 and 1204. In the exemplary illustrated embodiment, layer 1202 is 4 mm thick and layer 1204 is 3 mm thick in order to achieve a total thickness of approximately 7 mm. Layers with varying thicknesses may be combined to achieve the desired total thickness. This thicker breathable material combination improves the padding properties of the crib liner while having a negligible effect on breathability. The thicker breathable material may be achieved with a single layer; however, a single layer may be more susceptible to torsional strain. Further, a single layer with a thickness greater than 4 mm increases manufacturing costs.

As illustrated in FIG. 12A, an exemplary breathable material layered to form cross section 1200 may include a front substructure 1204, a pile substructure 1204b, and a back substructure 1204a. In the illustrated embodiment, back substructure 1204a is a the fine woven portion 922.

FIG. 12B illustrates an exemplary crib liner cross section 1220 configured with three layers of breathable material, 1222, 1224, and 1226, thereby creating a breathable material combination with a total thickness of 10 mm. An exemplary

cross section of stitching 1130 is shown, as discussed in conjunction with FIG. 11A. As shown, the exemplary stitching 1130 binds all three layers. The other embodiments, the stitching may bind only one layer or less than all of the layers.

FIG. 12C illustrates an exemplary crib liner cross section 1240 configured with three layers of breathable material, 1242 and 1244. An exemplary cross section of embossing 1150 is shown, as discussed in conjunction with FIG. 11B. As shown, the exemplary embossing 1150 only binds each individual layer; the embossing does not necessarily bind the layers together. However, the embossing 1150 may bind more than one layer.

FIGS. 13A-D show illustrations of an exemplary crib liner, which may be reversible, according to various embodiments of the present invention. In many embodiments, the breathable material will have a different fabric weave, fabric color, and/or ornamental features on one side of the panel, 1310, compared to the opposite side of the panel, 1320. This difference in fabric weave, fabric color, and/or ornamental features (e.g., stitching, embossing, fabric shapes, etc.) provides at least two options for sides of the panel which may be exposed to the outside of the crib (and conversely, the inside of the crib). In such configurations, the crib liner is sized and shaped to be reversible. Further, in such configurations, the various fastening apparatus are also configured to be used with either side of the panel exposed to the outside of the crib (i.e., reversible). In some embodiments, the breathable material will have a front substructure with one color while a back substructure has a different color. In such a configuration, the breathable material may be one layer of breathable material (e.g., breathable padded mesh, as shown in FIG. 2F). In embodiments with more than one layer of breathable material, such as illustrated in FIG. 12A-C, different layers of breathable material may be combined to create a reversible liner. For example, one layer of breathable material may be embossed with a pattern while the other layer of breathable material lacks embossing. As another example, both breathable material layers may be embossed, but with different patterns. As yet another example, one layer of breathable material may have a different fabric weave (e.g., FIG. 9A) compared with the other layer of breathable material (e.g., FIG. 9C). Additionally, the color of the layers of breathable material may differ.

FIG. 14 shows a crib liner according to one embodiment of the disclosure. A crib frame 402 may include a number of slats 404. A crib liner 410 may be weaved in and out of various slats 404. The crib liner 410 may provide cushioning for a child in the crib 402 to prevent injury from impact with the slats 404. The crib liner 410 may also provide a barrier to prevent a child in the crib 402 from extending appendages through the slats 404. The crib liner 410 may include a top portion 410a and a bottom portion 410b separated by a single layer mesh fabric 410c. The mesh fabric 410c includes a number of holes allowing circulation of air as described in detail above.

The top portion 410a and the bottom portion 410b of the crib liner 410 may be similar materials or different materials. In one embodiment, the top portion 410a and the bottom portion 410b may be fabric material provided for aesthetic purposes to improve the appearance of the mesh fabric 410c. According to another embodiment, the top portion 410a and the bottom portion 410b may be a cushioning material, such as fabric material filled with padding.

The crib liner 410 may be weaved in and out of each of the slats 404 as shown in FIG. 14 and secured to the slats 404 by a fastener 412. The fastener 412 may be, for example, a



ribbon that is tied around one of the slats **404** and tied in a bow. Although only one fastener **412** is illustrated, additional fasteners may be included to provide additional support.

According to one embodiment, the crib liner **410** may be a one-piece liner wrap design. The crib liner **410**, when a one-piece liner wrap design, may be adjusted for different crib sizes by wrapping the liner **410** multiple times around the slats **404** to consume a portion of the liner **410** in excess length that the perimeter of the crib **402**. According to other

embodiments, the crib liner **410** may be a multi-piece liner. For example, the crib liner **410** may include several lengths of shorter material, which may be assembled together to form an appropriate length for the crib **402**. Thus, the crib liner **410** may be adapted for use on cribs of different sizes.

Additional detailed illustrations of the crib liner **410** are shown in FIGS. **15A-C**. As shown in FIG. **15** the crib liner **410** may be weaved through the slats **404** only at corners of the crib **402**. Installing the crib liner **410** by weaving through the slats **404** at corners of the crib **402** may decrease the installation time of the crib liner **410** on the crib **402**.

Further details of the crib liner **410** are described below with reference to FIGS. **16-20**. FIGS. **16A-C** shows an illustration of the crib liner **410** having crib slat pads according to embodiments of the disclosure. FIG. **16A** illustrates a view of a crib liner **410** with crib slat pads **420** as seen from the outside of the crib after installation of the crib liner **410**. The crib slat pads **420** cover at least the portion of the slats **404** facing inside the crib **402**. The crib slat pads **420** may be made of fabric or other materials.

The crib slat pads **420** may be attached to the slats **404** through attachment mechanisms such as, for example, sewing, snapping, tying, zipping, Velcroing, buttoning, free form molding, clipping, and/or strapping the slat pads **420** to the slats **404**. According to one embodiment, the slat pads **420** are separate pieces that are inserted between the slats. According to another embodiment, the slat pads **420** line the inside of the crib **402** and adhere to the slats **404**. FIG. **16B** shows the crib liner **410** with slat pads **420** as viewed from the inside of the crib **402**. The slat pads **420** may cover substantially all of the slat **404** facing inside the crib.

In certain embodiments, such as that of FIG. **16A**, the slat pads **420** do not extend the entire circumference of the slat **404** such that a portion of the slat **404** is exposed. According to another embodiment, the slat pads **420** may be installed behind the crib liner **410** as shown in FIG. **16C**. In this embodiment, the crib liner **410** may be attached to the front of the slat pads **420**.

FIG. **17** shows a two-part liner system. According to one embodiment, the mesh **410c** of the crib liner **410** may be comprised of multiple fabrics or a combination of other materials. For example, the mesh **410c** may be divided into an upper fabric **410c1** and a lower fabric **410c2**. The lower fabric **410c2** may be selected to be a fabric having higher breathability than the upper fabric **410c1**. Thus, additional airflow may be allowed into the crib **402** at the child's head level.

Other configurations of the crib liner **410** with one or more fabric layers in the mesh are possible. According to one embodiment, the mesh **410** may include two or more cotton or poly-breathable outer layers with a breathable spaces mesh in-between the two or more outer layers. According to another embodiment, the mesh **410** may include two or more cotton or poly-breathable outer layers with a breathable poly foam in-between. According to yet another embodiment, a breathable poly foam may be placed in-between a thin mesh and a spacer mesh. Each of these

configurations may comprise the entire liner **410** or may be added to the crib liner **410** as additional layers. Further, these configurations may be applied to any of the embodiments described in this disclosure.

FIG. **18** shows the crib liner **410** with top rail according to one embodiment of the disclosure. As described above, the crib liner **410** may be attached to the crib **402** through various mechanisms. According to one embodiment, straps **422** are attached to the crib liner **410** such that the strap **422** may be extended over a rail of the crib **402** and attached again to the crib liner **410**. The attachment **422** may be straps, ties, Velcro, buttons, snaps, and/or a zipper.

FIG. **19A** shows the crib liner **410** attached to a second crib liner **424**. As a child grows the crib liner **410** may become insufficient to protect the child from the dangers of the slats **404**. The second crib liner **424** may be attached to the crib liner **410** to extend the height of the crib liner **410**. According to one embodiment, the second crib liner **424** may be the same material as the crib liner **410**. However, the second crib liner **424** may also be different material than the crib liner **410**. For example, the crib liner **410** may be a more breathable material than the second crib liner **424** to allow increased airflow to the child in the crib **402** when the child is laying down and sleeping. The second crib liner **424** may include attachment **422** as described above for attaching the second crib liner **424** and the first crib liner **410** to the crib **402**.

FIG. **19B** shows the crib liner of FIG. **19A** having the crib liner **410** and the second crib liner **424** may include a padded cover **426**. The padded cover **426** may cover a portion of the crib **402** to protect a child from impact with the hard surfaces of the crib **402**. The cover **426** may include slits through which the attachments **422** enter and exit the cover **426**. The cover **426** may be installed on, for example, a top railing of the crib **402**. However, the cover **426** may also be installed on other longitudinal structures of the frame from which the liners **410** and **424** may extend.

FIGS. **20A-B** show a crib liner **410** with an underneath mattress fabric **428**. The fabric **428** may be attached to the liner **410** or structurally integrated into the crib liner **410**. Extending the crib liner **410** underneath a mattress with the fabric **428** may prevent the liner **410** from slipping and prevents a child from extending appendages into otherwise unprotected spaces. The fabric **428** may be attached to one portion of the liner **410** and then stretched and attached to another portion of the liner **410** to allow the fabric **428** to fit cribs of different sizes. The fabric **428** may be attached to the liner **410** through fasteners **430** including sewing, strapping, tying, Velcroing, snapping, and/or zipping.

FIG. **20B** shows the crib liner in an unattached laid flat position. The bottom panel **428** may have substantially the same length and width as a crib mattress. The side panels **106,108** may have substantially the same length as the length of the bottom panel **428**. The end panels **102,104** may have substantially the same length as the width of the bottom panel **428**. In this embodiment, the crib liner may be placed directly on top of the mattress, and the side and end panels attached to the four sides of the crib using fasteners **430**, which may be disposed continuously or intermittently along the outer edges of the side and end panels.

FIGS. **21A-B** show a crib liner **410** with a receptor **434** for additional connecting pieces such as extra panels **436**. Through the receptor **434** additional components may be affixed to the liner **410** though any of the attachment mechanisms described above. According to one embodiment the additional components may be, for example, the panels **436**.

In some exemplary embodiments, the panels are formed substantially of a breathable material (e.g., mesh-type material). However, in some configurations, the panels may be formed of less than substantially of a breathable material. For example, a majority of the area of a panel may be formed of a breathable material. In other configurations, less than a majority of a panel may be formed of a breathable material, such as some of the configurations discussed herein.

The panels formed of the mesh-type material may be used in combination with one or more layers of other material adjacent to the mesh-type material. For example, in one embodiment the body portion of the panels may be formed with strips of padded material attached to the mesh-type material on one side. The strips of padded material may be disposed such that when the panels are attached to a crib, the padded materials line up with the vertical support elements of the crib and offset the mesh-type material from the vertical support elements, thus providing additional padding. The padded material may be any suitable material, not just the aforementioned mesh-type material.

The breathable materials allow for full air circulation. When a padded, soft breathable mesh material is utilized, further protection is provided to a child from bodily harm. When using one or more of the breathable mesh materials described herein, it is preferred that little rebreathing of carbon dioxide occur when a child's face is in direct contact with the material.

One skilled in the art will recognize that various types of padding may be used in addition to the breathable material in order to form one or more of the shapes of the objects previously described herein. Further, for example, such padding materials may be the breathable padded mesh material itself and/or other breathable materials, such as cotton, jersey, flannel, polyester, nylon, rayon, gabardine, terry cloth, etc.

The preceding described embodiments are illustrative of the practice of the invention. It is to be understood, therefore, that other expedients known to those skilled in the art or disclosed herein may be employed without departing from the invention or the scope of the appended claims. For example, various apparatus or steps of one embodiment described herein may be used with one or more other embodiments described herein to form various combinations of methods, systems, or apparatus contemplated by the present invention. As such, the present invention includes within its scope other methods, systems and apparatus for implementing and using the invention described herein.

What is claimed is:

**1.** A crib shield system suitable for use with a crib, the crib shield system comprising:

a breathable mesh body portion comprising not more than one layer, the one layer being a mesh-type material layer having a suffocation resistance level of less than about 15 cm H<sub>2</sub>O, the mesh-type material layer comprising:

a front substructure, a middle substructure comprising fibers, and a back substructure, wherein each of the front substructure, the middle substructure, and the back substructure comprise a mesh material, and wherein the front substructure, the middle substructure, and the back substructure are integrated by weaving the fibers of the middle substructure through the front substructure and the back substructure;

wherein the front substructure, middle substructure, and back substructure of the first mesh-type material

layer are quilted together along at least two integration seams crossing the mesh body portion;

wherein the at least two integration seams cross each other to create a pattern in the mesh body portion;

wherein the quilting anchors the middle substructure to the front substructure and back substructure along the at least two integration seams; and

wherein a majority of at least one of the front substructure and the back substructure is open to air when the crib shield system is positioned in the crib.

**2.** The crib shield system of claim **1**, wherein the at least two integration seams are generally linear and create a lattice pattern on the breathable mesh body portion.

**3.** The crib shield system of claim **1**, wherein the at least two integration seams are one of stitching or embossing.

**4.** The crib shield system of claim **1**, wherein the front substructure and back substructure have different fabric weaves.

**5.** The crib shield system of claim **1**, wherein the middle substructure is a pile substructure.

**6.** The crib shield system of claim **5**, wherein the pile substructure is lofted, matted, and/or bunched fibers.

**7.** The crib shield system of claim **5**, wherein the pile substructure is linear and extends between the front substructure and the back substructure.

**8.** The crib shield system of claim **1**, wherein the mesh body portion is at least partially transparent.

**9.** The crib shield system of claim **1**, wherein the breathable mesh body portion is collapsible.

**10.** The crib shield system of claim **1**, wherein the mesh-type material layer comprises a woven polymeric fiber mesh material having integrated front and back substructures.

**11.** A crib shield system suitable for use with a crib, the crib shield system comprising:

a breathable mesh body portion, the breathable mesh body portion comprising only mesh materials and comprising:

a first mesh-type material layer, the first mesh-type material layer comprising a single layer formed by a front substructure, a pile substructure, and a back substructure, wherein each of the front substructure, the pile substructure, and the back substructure comprise a mesh material, and wherein the pile substructure is integrated with the front substructure and the back substructure by weaving the pile of the pile substructure through the front substructure and the back substructure; and

a second mesh-type material layer;

wherein the first mesh-type material layer and the second mesh-type material layer are coupled together; and

wherein a majority of at least one of the front substructure and the back substructure is open to air when the crib shield system is positioned in the crib.

**12.** The crib shield system of claim **11**, wherein the pile substructure is lofted, matted, and/or bunched fibers.

**13.** The crib shield system of claim **11**, wherein the breathable mesh body portion is at least partially transparent.

**14.** The crib shield system of claim **11**, wherein the second mesh-type material layer is coupled to the first mesh-type material layer along the at least two integration seams.

**15.** The crib shield system of claim **14**, wherein the second mesh-type material layer comprises a single layer.

**16.** The crib shield system of claim **15**, wherein the second mesh-type layer comprises a front substructure, wherein the front substructure of the second mesh-type layer

is has a different fabric weave than the front substructure of the first mesh-type material layer.

**17.** The crib shield system of claim **11**, wherein the first mesh-type material layer and the second mesh-type material layer are configured to be substantially the same height and length; wherein the first mesh-type material layer and the second mesh-type material layer are configured to be secured together to form a single panel; and wherein both the first mesh-type material layer and second mesh-type material layer comprise openings too small to permit an infant to insert a finger or toe there through.

**18.** The crib shield system of claim **11**, wherein the breathable mesh body portion further comprises a third mesh-type material layer.

**19.** The crib shield system of claim **11**, wherein the back substructure comprises a woven portion with a first size of openings too small to permit an infant to insert a finger or toe there through, wherein the second mesh-type material layer comprises a woven portion with a second size of openings too small to permit an infant to insert a finger or toe there through; and wherein the back substructure is integrated with the woven portion of the second mesh-type material layer.

\* \* \* \* \*